The Senate

# Standing Committee on Rural and Regional Affairs and Transport

## Water policy initiatives

Final report

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# Chapter One

# Introduction

## Terms of Reference

1.1 On 14 September 2005, the Senate referred the following matter to the Senate Rural and Regional Affairs and Transport References Committee for inquiry and report by the last sitting day in March 2006:[1]

> The impact on rural water usage of recent water policy initiatives and the possible role for Commonwealth agencies, with particular reference to:
>
> (a) the development of water property titles;
>
> (b) methods of protection for rivers and aquifers;
>
> (c) farming innovation;
>
> (d) monitoring drought and predicting farm water demand; and
>
> (e) the implications for agriculture of predicted changes in patterns of precipitation and temperature.

1.2 The date for presentation of the report was initially extended to 22 June 2006. When the committee later found that, due to its commitments to other inquiries, it was unable to complete its round of hearings, the Senate granted a further extension to 30 November 2006.[2]

## Conduct of the Inquiry

1.3 The committee placed advertisements announcing the inquiry and calling for submissions in *The Australian* on 12 October 2005, 26 October 2005 and 9 November 2005. The committee also wrote to a number of interested individuals, organisations and state and Commonwealth agencies advising of the inquiry and inviting submissions.

1.4 The committee received 65 written submissions on the reference. The majority of submissions expressed concern about the impact of over allocation of water to irrigators in the Murray Darling Basin and the need to protect Australia's rivers and flood plains. A list of submissions is provided in **Appendix 1**.

1.5 The committee held six public hearings, in the following locations:

| | |
|---|---|
| **Canberra** | 7 March 2006 |

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1 *Journals of the Senate*, 14 September 2005.

2 *Journals of the Senate*, 20 June 2006.

| | |
|---|---|
| **Toowoomba** | 2 August 2006 |
| **Canberra** | 16 August 2006 |
| **Canberra** | 15 September 2006 |
| **Canberra** | 12 October 2006 |
| **Canberra** | 18 October 2006 |

1.6 On 16 August, 15 September and 18 October 2006, the committee heard from interstate witnesses by teleconference.

1.7 During the inquiry, the committee took evidence from 55 witnesses, including individuals with an interest in water policy issues, representatives of industry organisations, academics, scientists, conservation and indigenous groups, local councils and community organisations. The committee also took evidence from representatives of government bodies – both Commonwealth and state. A list of witnesses is provided in **Appendix 2**.

1.8 The *Hansard* transcript of all public hearings is available on the Hansard website at www.aph.gov.au.

## Interim Report

1.9 On 14 August 2006, amendments to the Standing Orders of the Senate resulted in changes to the structure of the committee system. As a consequence, the Rural and Regional Affairs and Transport (RRAT) References Committee ceased to exist as a separate committee on 10 September 2006.

1.10 Prior to the new arrangements coming into effect, the RRAT References Committee thought it appropriate to provide an interim report to the Senate, outlining the issues raised in the inquiry and providing a progress report in relation to the work of the committee. The *Rural and Regional Affairs and Transport References Committee, Water Policy Initiatives: Interim Report,* was tabled in the Senate on 7 September 2006.

1.11 The committee's interim report noted that the majority of submissions to the inquiry had come from individuals and organisations representing the Lower Balonne flood plain, Culgoa and Brewarrina areas. The submissions all raised concerns in relation to the over-allocation of water in South West Queensland.[3]

1.12 The interim report also noted that the following issues were raised in submissions and evidence provided to the committee:

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3 *Rural and Regional Affairs and Transport References Committee, Water Policy Initiatives: Interim Report,* September 2006, p. 2.

- The undeniable impact of drier climate conditions on water resources throughout Australia (with the possible exception of the Northern Territory).
- The social implications for downstream users of over-allocation of rivers upstream – allocations often made by another state than the one in which the downstream river dwellers reside.
- The failure to measure and account for water harvested from river flood plains.
- The lack of a definitive database and measuring tools relating to surface water resources (although good work is being done right across the country to fill in the gaps in many areas).
- The lack of understanding of our groundwater resources and their inter-relationship with surface water resources.
- The early development of a water trading regime.
- The relationship between rural and urban water needs.
- The role of recycling in meeting the water needs of the city and the farm in a drier environment.
- Calls for greater protection (and in a few cases greater regulated use) for Australia's pristine northern rivers.[4]

1.13 The committee's interim report acknowledged that the management of Australia's water resources is a difficult balancing act, and commented on the issues raised in submissions and in evidence to the committee. The committee did not make any recommendations in that report.

## Current Report

1.14 Following the changes to the Senate committee system, a new Legislative and General Purpose Standing Committee was formed - the Standing Committee on Rural and Regional Affairs and Transport – which took the place of the References Committee. The committee has a new membership and has appointed a new Chair.

## Structure of the Report

1.15 Chapter Two of the report provides background information regarding water policy and discusses the need for improved water resources planning and clearer definitions in relation to water entitlements and allocations. This chapter also provides comment on the need for better measurement of water usage and accurate and reliable data in order to facilitate improved water management and a more consistent national approach to water trading.

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4 *Rural and Regional Affairs and Transport References Committee, Water Policy Initiatives: Interim Report,* September 2006, p. 3.

1.16 Chapter Three focuses on the issue of over allocation of water from the rivers and flood plains of the Murray-Darling Basin. It outlines problems currently being experienced in the basin including the Condamine-Balonne catchment area. This chapter also raises issues such as the setting of 'caps' for the extraction of water and the need to accurately measure, and possibly reduce, water allocations.

1.17 Chapter Four describes the problems associated with reduced rainfall on the sustainability and security of Australia's water resources. Ways in which agricultural industries are attempting to adapt to reduced rainfall such as improved irrigation practices and drought resistant crops are described. Also discussed are the issues surrounding rural and urban water trading and water recycling.

# Chapter Two

# Water Policy Initiatives

## Background to water policy

2.1 Under the Constitution, the management of water resources in Australia is a state responsibility. However, the river on which south eastern Australia depends for most of its agriculture flows through three states and as early as 1915, the Commonwealth became involved as a facilitator in the negotiations and signing of the River Murray Waters Agreement between NSW, Victoria, South Australia and the Commonwealth. That agreement evolved into the Murray-Darling Basin Agreement signed by the same parties first in 1987 and again (as a new Agreement) in 1992. Queensland joined the original signatories in 1996 and the Australian Capital Territory joined in 1998.

2.2 The 1992 Agreement established the Murray-Darling Basin Ministerial Council and the Murray-Darling Basin Commission (which replaced the 1917 River Murray Commission). The Commission advises the Ministerial Council and implements its decisions which under the Agreement aim to promote and coordinate effective planning and management for the equitable, efficient and sustainable use of the water, land and other environmental resources of the Murray-Darling.

2.3 Greater environmental awareness in the 1980's led to a recognition that a national approach to environmental problems was called for. The Council of Australian Governments (COAG), comprising the Commonwealth and all states and territories became the key policy forum on natural resource issues, including the management of water. In 1992, COAG adopted the National Strategy for Ecologically Sustainable Development which established natural resource development and management on a national basis.

2.4 In 1994, COAG announced its water reform agenda which included the National Water Quality Strategy. A joint Commonwealth, states and territories initiative, the strategy consists of 21 guideline documents for managing key elements of the water cycle. By 1995, the Murray-Darling Basin Ministerial Council had become sufficiently concerned about the pace of development along the Murray, and the possible environmental impact on many areas downstream of the river, to consider capping diversions from the basin's rivers at 1994 levels. Special conditions were set for South Australia, and since Queensland had not yet signed the Agreement, a cap for Queensland was left for a later decision.

## The National Water Initiative

2.5 The National Water Initiative (NWI) was signed by the Commonwealth and all states and territories (except Western Australia and Tasmania who signed

later) on 25 June 2004. It built on the previous COAG's framework for water reform that had been put in place since 1994. The NWI represents the Australian Government's and state and territory governments' shared commitment to water reform. The National Water Commission, an independent statutory body in the Prime Minister's portfolio was established to drive the national water reform agenda and to provide advice to COAG on national water issues.

2.6 The principal goals of the NWI are to increase the productivity and efficiency of Australia's water use for the benefit of urban and rural users and to ensure the health of river and groundwater systems. The signatories also agreed to work towards returning all water systems to environmentally sustainable levels of extraction[1] because it was recognised at the start of the initiative that most systems were over allocated and that it was imperative to address that problem.

2.7 The Australian Government allocated $2 billion to the *Australian Government Water Fund* to invest in water infrastructure, improved water management, and better practices in order to improve Australia's water efficiency and achieve environmental outcomes. From the *Water Fund*, a total of $200 million over five years has been allocated to the *Raising National Water Standards Programme* which aims to advance the implementation of the National Water Initiative through:

- improving the capacity to monitor, evaluate and report on water resources at the national, regional and catchment level;
- improving the knowledge, information and skills needed to better manage our water resources, and
- enhancing innovation for rural and urban water use efficiency.

2.8 The Australian Government's also allocated $1.6 billion to the *Water Smart Australia Programme* with the aim of accelerating the development and uptake of smart technologies and practices in water use across Australia. The Programme is funded over five years until 2010. Another programme, the *Community Water Grants Programme* will provide grants of up to $250 000 to communities to promote the wise use of water.

2.9 The National Water Commission website states that: "The overall objective of the NWI is to achieve a nationally compatible market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes. At the highest level, implementation of the NWI aims to achieve:

- clear and nationally-compatible characteristics for secure *water access entitlements;*
- transparent, statutory-based water planning;

1 *Intergovernmental Agreement on a National Water Initiative*, 25 June 2004, p. 1.

- statutory provision *for environmental and other public benefit outcomes*, and improved environmental management practices;
- the return of all currently over-allocated or overused systems to *environmentally-sustainable levels of extraction;*
- progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market to be in place;
- clarity around the assignment of risk arising from future changes in the availability of water for the *consumptive pool;*
- water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management;
- policy settings which facilitate water use efficiency and innovation in urban and rural areas;
- an assessment of future adjustment issues that may impact on water users and communities; and
- recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource."[2]

2.10 While the committee recognises the complexity of the task facing the National Water Commission, the Murray Darling Basin Commission and the government bureaucracies involved, the committee has been concerned for some time at the slow pace of implementation of the NWI objectives.

## The need for better water resources planning

2.11 The National Water Commission released its assessment of state and territory performances in the area of water reform in June 2006. The assessment found that all jurisdictions had made slower than anticipated progress in the area of water resources planning and management. The committee notes that NSW has continued to be a poor performer in the area of water planning, in spite of the Commission having identified specific concerns in the past for it to address. As the imposition of past penalties has had no effect on improving NSW's performance, it is doubtful whether the new suspended penalties will prove more effective. WA, a relative newcomer to the National Water Initiative, was also penalised for slow progress and for not completing its overarching planning framework.

2.12 The Queensland Farmers Federation (QFF) expressed frustration at the slow progress of water resource planning in Queensland and expressed the view that:

2 Website, National Water Commission, p. 2, http://www.nwc.gov.au/nwi/index.cfm#overview

> the development of water markets and trading in Queensland will be constrained for at least another 5 years by the ongoing program of reform implementation and a number of limitations on the effective functioning of trading markets in local areas.[3]

2.13 QFF called for improvements to water resource accounting systems and metering as an essential step towards better planning pointing out that because of lack of monitoring and lack of adequate data, Water Resources Plans currently being developed may not be contributing to sustainable practices on farms.[4]

2.14 The committee urges all states and territories to give higher priority to water resources planning and management. The lack of planning will hinder the development of a robust water trading market. The severity of the current drought provides a strong reason for taking into account the known risks such as drought, climate variability, changes to the management of irrigation water, afforestation, groundwater extraction and the impact of bushfires and adopting a better risk assignment framework within the NWI implementation plans as advocated by the National Water Commission.

**Recommendation 1**

**2.15 The committee recommends that the signatories to the National Water Initiative (NWI) adopt a better risk assignment framework within the NWI implementation plans and speed up the establishment of a publicly-accessible nationally compatible register of water entitlements.**

2.16 Evidence to the committee's inquiry pointed out that a major impediment to good planning was the lack of reliable data about water flows in catchment areas, rivers and their associated floodplains and about groundwater resources. The committee will return to this later in this chapter.

## Water Property Titles

2.17 Australia does not have a single definition of a water property right in use across the continent in the way that the Torrens Title defines the right to land ownership. The Australian Spatial Information Business Association (ASIBA), a prime mover in getting the issue of a water property right on the national political agenda, was critical of the states' failure to develop uniform property rights:

> The states and territories have developed *ad hoc* property rights and systems that bear little resemblance to the cohesive national model that the National Water Initiative originally intended.[5]

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3 *Submission* 34, Queensland Farmers Federation, p.2.

4 *Submission* 34, Queensland Farmers Federation, p.4.

5 *Submission* 36, The Australian Spatial Information Business Association, p. 1.

2.18 The Australian Property Institute was equally critical of what it saw as the reluctance of state agencies to adopt a nationally consistent system of defining water property titles. The Institute called for the establishment of a verifiable national database to provide the public and the banks with the level of confidence needed to ensure secure trading.[6]

2.19 Not only does each state and territory have its own system of water rights but matters are made more difficult by the fact that different terminology is used in different states to describe those rights. The CSIRO pointed to difficulties caused by the fact that across Australia, the words 'allocation' and 'entitlement' have different meanings.

2.20 In some states, the word allocation is used to define an entitlement while in others it is used to define both entitlements and allocations.[7] The National Water Initiative defines 'water access entitlement' as:

> a perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan.

and 'water allocation' as:

> the specific volume of water allocated to water access entitlements in a given season defined according to rules established in the relevant water plan.[8]

2.21 In its submission, the CSIRO pointed out that one of its researchers had identified no less than 438 types of regulated surface water entitlements in the three south-eastern states through which the Murray River flows.[9] The same research has pointed to the possibility of having anything between 14 and 89 types of water licences in New South Wales alone.[10]

2.22 Professor Michael Young told the Committee that "in an idealised world you need no more than two access entitlements per system":[11]

> A highly reliable entitlement that in all but the most adverse of conditions delivers the same quantity of water from year to year; and

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6 *Submission* 37, The Australian Property Institute, p. 2.

7 *Rural Water Use and the Environment: The Role of Market Mechanisms*, Productivity Commission Research Project, CSIRO Submission, February 2006, p. 3, (Tabled Document, 7 March 2006).

8 *Intergovernmental Agreement on a National Water Initiative*, 25 June 2004, Schedule B(i), p. 30.

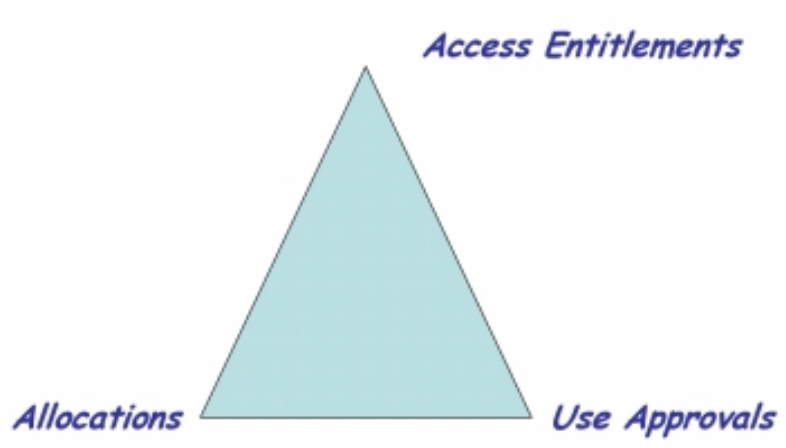
9 *Submission 40*, CSIRO, p. 8.

10 Professor Michael Young, Allocation and coordination of water resources, Towards a national water policy framework: vision to implementation, Conference Proceedings 2003, United Nations Association of Victoria, p.10.

11 Professor Michael Young, CSIRO, *Committee Hansard*, 7 March 2006, p. 44**.**

> An entitlement whose allocations vary from year to year within a risk management and predictability framework based on detailed water budgets and climate predictions.[12]

2.23 In its submission, CSIRO explained how a more efficient and equitable management of water access entitlements over time could be achieved through unbundling water titles into at least three different components as set out below:




*Framework for the definition of opportunities to hold, manage and use water*

2.24 CSIRO's submission stated that under the framework it was proposing, "water access entitlements would be used to manage equity issues in water allocations; associated low cost trading arrangements would be used to ensure that water is used efficiently; and use approvals would be used to manage the impacts on the environment and on adjoining land holders."[13]

2.25 There is no doubt that a simplified system of entitlements will facilitate trade, but the committee is aware that the CSIRO itself stated in its submission that the costs of rationalisation may well outweigh the potential benefits.[14]

2.26 Like the CSIRO, ABARE sounded a warning note on the issue of taking apart the existing systems before moving forward. While supportive of the 'unbundling' of water rights ("making explicit the rights that are implicit in the original entitlement"), ABARE pointed out that "managers should consider whether completely defining a property right is justified" since "the costs of establishing, administering and enforcing unbundled rights might be prohibitive".[15]The committee notes that progress is being made despite the

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12 *Rural Water Use and the Environment: The Role of Market Mechanisms*, Productivity Commission Research Project, CSIRO Submission, February 2006, p. 5, (Tabled Document, 7 March 2006).

13 *Submission 40*, CSIRO, p. 5.

14 *Submission 40*, CSIRO, p. 8.

15 *Submission 12*, ABARE, p.4.

difficulties and the costs, with Victoria taking the lead on the matter of unbundling:

> Many states have made progress in separating the water rights from land holdings. In Victoria, for example, plans have been made to unbundle rights into water shares, delivery shares and water use licences by mid 2007.[16]

2.27 The committee's view is that consistent rules across the Murray Darling Basin in relation to water trading would greatly assist the establishment of a more robust trading system. While it may not be feasible in the short term to achieve the ideal of two types of water access entitlement, the committee urges all the agencies involved to work towards simplifying the system with a view to the eventual adoption of a national approach to water property rights.

2.28 The committee also believes that uniform terminology in relation to water property rights should be adopted across all jurisdictions as a matter of urgency. Only then will those who wish to engage in interstate water trading, and the Australian public, have the confidence that at least the key terms used in water trading negotiations and documents have a single definition, and one that is accepted nationally.

**Recommendation 2**

**2.29 The committee recommends the adoption of standardised terminology and a simplified, nationally consistent approach to water property entitlements.**

2.30 A national approach will also facilitate the setting up of compatible water registers by the states. The National Water Commission recognises the need for making water entitlements more secure by registering water entitlements on publicly-accessible and reliable water registers and told the committee that:

> The NWC for the NRM Ministerial Council NWI Committee developed a suite of shared characteristics for compatibility of registers to be implemented by states. The NWC is currently convening an Industry Contact Group to explore options for ensuring that registers of individuals entitlements within a bulk irrigation entitlement held by an irrigation entity are compatible with state-based registers.[17]

2.31 The committee welcomes this initiative as a first step towards the establishment of a national water property right database. A single, reliable source of information about water property rights will give confidence to those engaged in water trading.

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16 As above, p.4

17 *Submission 39a*, National Water Commission, pp. 6-7.

## Water Trading

2.32 The facilitation of an open trading market is one of the key objectives of the National Water Initiative. In order to do this, the National Water Commission has been working with the states and territories to remove barriers to trade. While recognising the immense task facing the Commission, the committee has been concerned at the slow pace at which those barriers to trade are being dismantled.

2.33 The National Water Commission told the committee that while all of the southern MDB states have undertaken steps that they consider to be required individual actions under the NWI to enable trade within their boundaries, they had:

> … failed to undertake the necessary collective actions to open up trade between their respective jurisdictions and to ensure competitive neutrality.[18]

2.34 Accordingly, under the 2005 National Competition Policy assessment, the Commission recommended that New South Wales, Victoria and South Australia each receive a suspended penalty of 5% of their 2005 competition payments, recoverable if adequate progress was made by 1 January 2007. Progress on this front has now been hastened through the Ministerial Summit on the Southern Murray-Darling held in Canberra on 7 November 2006. In the face of reduced river flows in the Murray-Darling Basin (MDB), exacerbated by the current drought, New South Wales, Victoria and South Australia have agreed to ensure that permanent interstate water trading will commence in the MDB on 1 January 2007.[19]

2.35 The major benefit of water trading schemes when well designed and implemented, is that they can provide an efficient and cost-effective way of reallocating limited resources to ensure highest value use. Under ideal circumstances a well-designed, robust trading system should be flexible, adaptive, transparent and equitable. It should also deliver security and economic efficiency, along with low trading and administrative costs.

2.36 The Murray-Darling Basin Commission told the committee in its submission that trade in annual allocations in the MDB is more common than trade in entitlements.[20] Trade in annual allocations is also referred to as 'temporary' trade, whereby a 'share' of a water access entitlement is sold to the farmer who is able to realise the highest return on the amount of water available. Mr Bob Douglas expanded on this in evidence, stating that a high level of temporary trade in the MDB has enabled farmers to draw the maximum benefits from their water allocations at a time when they face very low rainfalls:

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18 *Submission 39a*, National Water Commission, p.7.

19 *Key Outcomes of the Summit on the Southern Murray-Darling Basin*, Canberra, 7 November 2006.

20 *Submission 35*, Murray-Darling Basin Commission, p. 2.

> By doing that they actually preserve their investment and see in the next year. In round figures, the temporary trade has quite a significant effect in reducing the effect of drought. It is still quite serious, but it is not as bad as it otherwise would have been. [21]

2.37 That evidence points clearly to the success of part of the goal of the National Water Initiative in establishing trading. However, the committee is conscious that the lack of permanent interstate trading to date, has led to widespread perception that there has been no permanent trade in water at all. The MDB Commission was at pains to stress that this was not an accurate perception of the situation:

> There is a perception that the amount of interstate trade is small because it is small every year, but you have to remember that it has a cumulative impact. If you move your water permanently, it is always going there. This chart actually plots the cumulative effect of water trade up to 2003-04. We find that, in round figures, about 18 per cent of the water in the southern basin has been traded. We do not distinguish between how much of that has been traded within districts and how much has been traded between districts. [22]

2.38 The committee is conscious that only a robust permanent trading market will achieve the NWI objective of maximum efficient use of our water resources. The inquiry revealed a great need for accurate information on which to base water trading decisions and for a reliable water accounting system to assist the development of the trading market.

### *The Need for Better Data*

2.39 The majority of witnesses who gave evidence to the inquiry commented on the need for better measurement of water use and for a database that will hold as much information as possible about water resources:

> We believe that there must be a verifiable database of water resources that is accurate and current.[23]

2.40 The evidence before the committee suggests that the National Water Commission recognises the need for more and improved data. However, since it is working in an area of great complexity where data collection has not been a priority in the past, progress appears to be slow. The Commission gave evidence to the committee that:

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21 Mr Bob Douglas, Director, Water Policy Co-ordination, Murray-Darling Basin Commission, *Committee* Hansard, 12 October 2006, p. 11.

22 As above, p.10. Note: The chart referred to in this quote is available as a tabled document.

23 Mr David Hocking, Chief Executive Officer, Australian Spatial Information Business Association, *Committee Hansard,* 7 March 2006, p. 59.

> On water accounting, metering and water data, there has been excellent cooperative work between the commission and amongst the governments that are parties to the National Water Initiative on accounting and metering standards. … The commission recently co-hosted, with representatives of the expert steering committee on Australian water resources information, a water data summit. The main intent of that summit was to ensure that there is open access to Australia's water data on the internet, and we are working towards delivering that in practice.[24]

2.41 The majority of the data is not only held by the different jurisdictions, but is also in different formats and the same concepts are often defined in different terms:

> The level 1 assessment has really borne it out that there is no nationally consistent definition of sustainable yield. The states and territories have varying degrees of how they define that. That is coming up as a gap and limitation in trying to do a national assessment. If the definitions vary, it is very difficult to get a consistent picture.[25]

2.42 Nevertheless, the NWC and all states and territories continue to work towards improving the quality of the data contributed to the national baseline assessment of water resources being compiled by the Commission. The Level 1 assessment provides the performance indicators towards which the states and territories are working in dealing with water management. This information has now been published and is available at: http://www.water.gov.au

2.43 The Level 2 assessment is due to be published in early 2007. It will provide much awaited data, including analysis that will enhance the current understanding of water availability, water use, and river and wetland health.

2.44 According to the National Water Commission, products of the Level 2 baseline assessment will include:

- integrated surface water and groundwater balances for 50-70 priority catchments, capital cities, basins and regions;
- comprehensive statistics on water use in 2004-05; and
- a new framework for a national assessment of river and wetland health, building on existing state approaches.[26]

2.45 At the Supplementary Budget Estimates hearings on 31 October 2006, Dr Chartres gave evidence that in addition to the level 2 base line assessment, the Commission is working with the Bureau of Rural Sciences, the Bureau of Meteorology, the CSIRO, Geoscience Australia and the National Land and Water

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24 National Water Commission, *Committee* Hansard, 15 September 2006, p. 16.

25 National Water Commission, *Committee* Hansard, 15 September 2006, p. 24.

26 *Submission* 39a, National Water Commission, p. 4.

Resources Audit towards a database called the Australian Water Resources Information System (AWRIS) that will provide real time access to water resources data and, ultimately, aggregated water accounts.[27]

2.46 A key feature of AWRIS is that it is developing a process whereby in future data can be collated from state and territory agencies and other sources using web-based technologies. The committee welcomes this development as it will go some way to filling the huge gap in water resources data and tools that can deliver reports to policy makers and irrigators as well as to the farming community.

2.47 The committee raised concerns with the Department of Agriculture, Fisheries and Forestry about farmers' and irrigators' need for up-to-date water resources information that the National Land and Water Audit – coming as it does every five years – cannot fulfil. In response, the committee was told that the Bureau of Rural Sciences is developing the Water 2010 project to address this issue:

> … our objective to try to gather together all the information that exists across the country—in state jurisdictions, in the main—and to collate it in one place. The aim is to be in a position across Australia, in the next two or three years on a kilometre-by-kilometre grid, to be able to do a water balance—what the rainfall is; what the discharge to the ground water and to rivers is; what the draw-down by industries or whomever is — and be able to answer those sorts of questions. [28]

2.48 The Water 2010 project aims to produce an interactive website and CD ROM to enable users to explore factors influencing Australia's dynamic water balance. It applies a land-use mapping-based approach to show how and where water is generated and used, including run-off, transpiration, irrigation and groundwater. To ensure the most current data is available to users, the website will be integrated with a national water database, and will be maintained and continuously updated by state and Commonwealth agencies.

### *Standards and measures*

2.49 While the NWI's goal of implementing a robust water trading system is dependent on the availability of reliable water resources data, it is equally reliant on the development of sound water accounting measures. The committee notes that the National Water Commission's Science Advisor, Dr Colin Chartres has called for national scientifically based standards for metering, gauging monitoring and reporting to be agreed by all the states involved in the NWI. Dr Chartres argues

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27 Dr Colin Chartres, General Manager, National Water Commission, *Estimates Hansard,* 30 October 2006, p.75.

28 Dr Colin Grant, Bureau of Rural Sciences, *Committee Hansard,* 7 March 2006, p.86.

that new measurement technologies now exist that will simplify the process of collecting data about water use.[29]

2.50 He was supported in this by the West Australian Farmers Federation (WAFF) who called for:

> All irrigation usage above 5 megalitres per year (or such amount determined by the regulator from time to time) should be metered. Information about each individual's usage, together with usage patterns in the irrigation area should be made available online. The near absence of compulsory metering is a serious shortcoming in the State's water resource management process.[30]

2.51 The adoption of standardised metering is just one of the challenges in the area of water accounting. CSIRO pointed out in its submission that most water entitlements across Australia are defined as gross (not nett) entitlements. The means that:

> Whenever one irrigator adopts a more efficient form of irrigation, the amount of water that returns to the river or aquifer decreases and hence less water is available either to other water users or to the environment. [31]

2.52 CSIRO's submission explains that the effect of using gross entitlements is that efficient irrigators (often downstream) need to keep acquiring more water just to "stand still", that is irrigate the same area, because others upriver are increasing the efficiency of water use. [32]

2.53 This is not an argument against using water more efficiently; rather it is a caution that the effects of doing so must be factored into the water accounting system when decisions are being made about water allocations. The volumes of water involved could be large: CSIRO referred to an estimated net reduction of around 1,692GL from the Murray's river flow (and allocations to irrigators) as a result of reduced drainage from water use efficiency savings, various land use impacts and increased groundwater usage in the basin. That reduction is equivalent to more than one tenth of the Murray's average annual water use. Together with factors such as reduced rainfall, reduced run-off and increased ground water extraction from areas connected to the river, it is a shortfall that must be taken into account if the issue of over allocation is to be resolved.

2.54 The past ten years have seen a situation of continual change in relation to how water resources are allocated and used in this country. Increasing awareness of the need to monitor, manage and regulate our limited and increasingly precious

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29 Dr Colin Chartres, A Strategic Science Framework for the National Water Commission, p. 24.

30 *Submission* 23, West Australian Farmers Federation, p.7.

31 *Submission 40*, CSIRO, p. 6.

32 As above.

water resources, combined with advances in water monitoring and metering technologies, have lead to a growth of the data collected and potentially collectable by water management agencies. Given the complexity of water management issues and the need to ensure transparency and accountability for water use stakeholders, it has become increasingly important to ensure that water management decisions are made on the best data and best science available. The greater availability of reliable data will facilitate a number of key processes including:

- water policy development;
- better water planning and water management; and
- regulation of water extraction from our rivers, lakes and aquifers.

2.55 Greater access to reliable data will also benefit those scientists and researchers who are tasked with finding ways of helping us to adapt to drier conditions and to make more efficient use of the water resources available. The committee welcomes AWRIS and initiatives such as Water 2010 that will improve the data available about water resources around the country. They will go some way towards facilitating access to information about water resources for experts, as well as for farmers and the general community. But while AWRIS and other similar initiatives are addressing the problem of lack of data about water resources, two issues need to be resolved before the data can become a useful and flexible tool in the process of managing and maximising our water resources:

- the lack of a single protocol ensuring the use of standardised data formats, methods of collection and terminology *and*
- a commitment on the part of all the states and commonwealth agencies involved to openly share whatever data is available.

2.56 While CSIRO, the Bureau of Meteorology or the Bureau of Rural Sciences gave evidence that they have the capacity to develop good monitoring systems and large databases of information, they do not have the ability to require states and agencies to conform to common data standards and protocols, nor can they obtain data unless the agencies who hold it around the country choose to make them available. The signatories to the NWI initiative are the governments with the power to adopt the necessary protocols and common standards about collecting data and to make it mandatory for the data to be available through national databases and registers.

2.57 For this to happen, COAG needs to require the National Water Commission or another agency to develop the necessary standards, protocols and framework which will eventually be adopted by all the NWI signatories. The states and territories need to commit to make the metering and reporting of water usage mandatory in their jurisdictions and agree to share the data that becomes available through this process.

2.58 The willingness to standardise data, agree to common protocols and share all available information is also necessary to allow decision makers to have at their

disposal expert systems that give a complete picture about water resources, climate and atmospheric modelling and drought assessment. CSIRO's proposed WRON project (which is discussed in Chapter 4) will only achieve its goal of up-to-the minute information about water usage and availability if its developers can obtain the base data from all state and federal agencies as well as the relevant research centres. Only when that happens will decision makers be able to make useful forecasts of seasonal allocations with a known degree of uncertainty.

2.59 The committee is only too aware, however, that it can often be a formidable task for land and water managers to access the type of information that is most relevant to them. To address this issue, the National Water Commission should develop a communications programme that will produce communications products and tools to help particular client groups (including farmers and irrigators) to access water resource data and make informed management decisions. That programme should include the development of internet portals that package and make this information accessible in a format that meets the usage needs of particular users at the local level.

**Recommendation 3**

**2.60 The committee recommends that the National Water Commission assume responsibility for making all the data currently available about water nationally accessible through integrated databases linked to its website.**

**Recommendation 4**

**2.61 The committee recommends that the National Water Commission develop a communications programme aimed at facilitating access to new research and new sources of online information about water resources and adapting to climate change for specific rural and regional client groups.**

### *Exit fees*

2.62 The decision on the part of any one party to permanently sell its water entitlement has implications for other parties within an irrigation scheme. The remaining members of that irrigation scheme have to share the fixed costs of bringing the water to their properties. If those costs become so onerous as to discourage the remaining members of the scheme to remain, the irrigation authority could find itself with stranded infrastructure assets. The imposition of 'exit fees' is one mechanism that has been used to slow the pace of water being sold out of an area (thus leaving the infrastructure 'stranded') while ensuring that the cost of maintaining the asset does not fall entirely on the remaining members of an irrigation scheme.

2.63 In its submission, ABARE advocated the payment of exit fees annually to spread the cost.[33] The Productivity Commission has recommended the removal of exit fees which it saw as anti-competitive and a barrier to trade. Farmers and irrigators alike have argued against that recommendation. The Australian Competition and Consumer Commission (ACCC) is currently considering the impact of access and exit fees as a means of reducing stranded assets. The MDBC told the committee:

> Without trying to prejudge what the ACCC are going to say, I would not be surprised if they set boundaries on what size access and exit fees should be rather than necessarily say that you cannot have them. That is a means of basically slowing the rate of adjustment. In some cases, for example in the high-impact salinity zones in Sunraysia, government has actually made a decision that they want water to move out of those areas because of the salinity impact and they do not allow net trade back in. So in some cases governments have deliberately made decisions that they want that kind of adjustment to happen over time because of the salinity impact. [34]

### *Social impacts of permanent water trading*

2.64 While seeing permanent trade as a positive development for better management of the country's limited water resources, the committee is concerned about the social impacts of any permanent trade of irrigation water out of a particular region. The National Water Commission gave evidence to the inquiry that there are built-in safeguards within the National Water Initiative to ensure that the pace of structural adjustment is manageable for the local communities involved.

2.65 One of those safeguards is the current imposition of a limit of four per cent (per year) to the number of permanent water entitlements that can be traded out of an irrigation area. Over a number of years, that percentage can grow. The committee heard evidence that in the Pyramid-Boort region of Victoria (north-west of Bendigo), the percentage of permanent water entitlements traded has gone over 20 per cent. [35]

2.66 The decision of these Victorian farmers to abandon their properties is not solely related to pricing changes in their product markets. As noted above, the problems associated with soil salinity in this region of Victoria have also been a contributing factor. The committee notes that in this case – as in most other cases to date – the permanent water entitlement has primarily been traded to other regions of the same state.

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33 *Submission 12*, ABARE, p. 10.

34 Mr Bob Douglas, Director, Water Policy Co-ordination, Murray-Darling Basin Commission, *Committee* Hansard, 12 October 2006, p. 12.

35 Mr M. Thompson, General Manager, National Water Commission, *Committee Hansard*, 15 September 2006, p. 27.

2.67 The committee was told that the Victorian government is monitoring the impacts of permanent water trade on the local community. Under the NWI, the National Water Commission has an ongoing role to monitor and assess the impact of water trading. The NWC told the committee that, in relation to the Pyramid-Boort area, an assessment of the community impacts was currently being conducted using National Heritage Trust funding and that it was also getting ready to do its own assessment of the impacts.[36]

2.68 The committee is aware that a review of all aspects of water trade, including its impacts on local communities, must be carried out by the Commission in 2009. However, the committee is supportive of ongoing assessment and monitoring of the situation in areas like Pyramid-Boort where a substantial level of permanent trade is being carried out. Only then will it be possible to minimise negative social impacts. Individuals and local communities should be provided with appropriate assistance and social services to adjust to the changes that transition from one industry base to another inevitably brings.

36 Mr M Thompson, General Manager, National Water Commission, *Committee Hansard*, 15 September 2006, p. 21.

# Chapter Three

## 'Over allocation' - the major problem

### The Murray Darling Basin

3.1 The major problem brought to the attention of the committee in submissions and oral evidence during its inquiry is the vexed issue of over allocation of river water in the whole Murray-Darling Basin, an area which receives 6.1 per cent of Australia's distribution of run-off but where nearly 75% per cent of the country's irrigated agriculture occurs.[1]

3.2 More than 66 per cent of the water that would normally reach the sea from all rivers in the basin is now diverted for use. There has been a large increase in diversions since the 1950s and more particularly in the 14 years to 1996 which saw almost a 60 per cent increase in the use of surface water for irrigation in the basin. Regulation has eliminated the most extreme of the low flows (and is credited with keeping the Murray flowing during the 1982-1983 drought), but the level of diversions is having a huge negative impact on the health of the river.

3.3 The Murray-Darling Basin Commission's website tells the story of over regulation and over allocation starkly:

- Mean outflow from the Murray to the sea reduced from some 12,300 gigalitres (GL) per year under natural conditions to 4,900 GL per year (40 per cent of natural flows)
- Median annual flow to the sea (i.e. the flow that is exceeded in 50 per cent of years), is now only 27 per cent of the natural median flow.
- From around 3,000 GL in 1930, diversions now total over 11,000 GL (Thomson 1994, 8).[2]
- Rivers in the basin are now in a state of drought (as defined by river levels) for more than 61 years in every 100 compared with 5 years per hundred under natural conditions (MDB Ministerial Council 1995, 19). [3]

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1 Dr Colin Chartres, A Strategic Science Framework for the National Water Commission, p. 6-7.

2 Note: The average annual surface use of water from the MDB in the years to 2004-2005 was estimated to be 11,518 GL, MCDC Factsheet, July 2006.

3 MDBC, The Impacts of Water Regulation and Storage on the Basin's Rivers, www.mdbc.gov.au/nrm/water_issues/impact_of_water_regulation_and_storage

- Flows that were only naturally experienced in the driest 10 per cent of years are now expected in 27 per cent of years (MDBMC 1995, 25).

3.4 Recently updated figures on the effect of the current drought on the state of the Murray-Darling Basin, can be found at: http://www.mdbc.gov.au/rmw

3.5 In 1995, the MDB Commission's audit of water use in the basin revealed that water diversions from the rivers in the basin had increased by 8 per cent in the previous six years and were averaging 10800GL per year.[4] However, by the end of 1996, NSW, Victoria and South Australia had agreed to cap diversions from the river.

3.6 The states and territory dependent on water in the Murray-Darling Basin are now committed through the National Water Initiative to work towards sustainable management of the rivers in the basin and their catchments. But, referring to the states, CSIRO's Shahbaz Khan told the Triennial Maize Conference at Griffith, NSW in February 2006:

> All their water resources Acts are based on political rather than catchment/hydrological boundaries. Catchment management boundaries are required for ecologically sustainable management at the national level.[5]

3.7 To complicate matters further, water licences in the MDB have been issued on the expectation of water flows based on average rainfall for the last century. Climatologists are now throwing those averages into doubt since they believe that the 50 years from 1950 to 2000 may have been unusually wet for the Australian continent and that we may now be reverting to a normal rainfall pattern. Prof. Shahbaz Khan argues that both the "cap" and the Living Murray Initiative may be based on those over-optimistic "wet" rainfall and river flow figures.[6]

## Capping river extractions

3.8 The "cap" as agreed by the Murray Darling Basin Ministerial Council in 1996 was defined as follows:

- For NSW and Victoria, the Cap is the volume of water that would have been diverted under the 1993/94 levels of development plus allowances in the Border rivers for Pindari dam (NSW) and in the Goulburn/Broken/Loddon system for lake Makoan (Victoria)

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4 MDBC, Water Audit Monitoring Report 2004-2005, Report of the Murray Darling Basin Commission on the Cap on Diversions, June 2006, p.14 http://www.mdbc.gov.au/nrm/the_cap/wam_reports

5 Prof. Shahbaz Khan, *Managing Climate Risks in the Driest Continent: Options for Water Policy and Irrigation Management*, p.7-8, Paper presented at the Triennial Maize Conference at Griffith, NSW in February 2006; tabled document, 7 March 2006.

6 Prof. Shahbaz Khan, tabled document - as above.

- For South Australia, *All Other Purposes* diversions were capped at 440.6 GL. This represents an increase in diversion over 1993/94 levels of development but they are below allocations that were established in 1969.

3.9 The cap for Queensland was to be determined at a later stage. The Murray Darling Basin Commission points out in its Water Audit Monitoring Report 2004-2005 that the cap in NSW and Victoria is not the volume of water that was used in 1993/94. Rather, the cap in any year is the water that would have been used with the infrastructure (pumps, dams, channels, areas developed for irrigation, management rules etc.) that existed in 1993/94 taking into account the climatic and hydrologic conditions that were experienced in the year under consideration. [7]

3.10 In relation to the MDB caps, it is a matter of grave concern to the committee that 10 years after the beginning of negotiations designed to set a cap on river extractions, the cap for Queensland has still not been finalised. In its 2004 report, *Rural water resource usage,* the committee recommended that:

> A cap for water extractions in the Queensland part of the Murray-Darling Basin should be decided by the beginning of 2005.

3.11 The Chief Executive of the Murray-Darling Commission agreed that progress on cap implementation and other water reform aspects affecting the MD Basin had been slow and pointed to the difficulties inherent in getting several states to reach agreement on substantial issues:

> The original River Murray agreement in 1915 took 22 years to reach. Putting the cap in place took a decade. The agreement on environmental flows took a decade. Anything substantial takes a decade because you have to go through the whole process to get the information.[8]

3.12 The Murray-Darling Basin Commission does not expect the caps for extraction of river water in Queensland to be in place before sometime in 2007. [9] Settling the cap issue in some areas of Queensland is not an easy task especially since some stakeholders see their water extractions as having no effect further down river:

> The cap is inequitable and there have been distortions in the science of river flows and river ecology used to justify limits and cutbacks in water allocations…
>
> …Much of the water from Queensland river systems does not reach the NSW border, let alone the Murray river. [10]

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7 MDBC, Water Audit Monitoring Report 2004-2005, Report of the Murray Darling Basin Commission on the Cap on Diversions, June 2006, p. 13. http://www.mdbc.gov.au/nrm/the_cap/wam_reports

8 Dr Wendy Craik, CEO, MDBC, *Committee Hansard*, 12 October 2006, p.3.

9 Dr Wendy Craik, CEO, MDBC, *Committee Hansard*, 12 October 2006, p.4.

10 *Submission* 56, Chinchilla and District Water Users Association, p.3.

3.13 Evidence to the committee suggests that the implementation of caps remains a key water management problem. Even where caps have been set, as in the NSW part of the Murray-Darling Basin, those caps are not always fully implemented. Inland Rivers Network Coordinator, Ms Amy Hankinson pointed out that:

> Flood plain harvesting is also meant to have been brought under cap in New South Wales, but it has not been done to date, which calls into question New South Wales cap compliance.[11]

3.14 The committee believes that all state governments involved in the NWI should take the steps necessary to abide by the commitments they have made in relation to the caps. The committee urges Queensland to take steps to finalise its negotiations and agree to a cap on its water extractions. This is an urgent and critical issue for the health of the rivers concerned and for the farmers and others who depend on those rivers for their livelihoods. It demands a much higher priority.

### *Measuring and reducing allocations*

3.15 Over allocation results from lack of, or inadequate, knowledge about the rivers from which the water is taken. The need for broader knowledge and more precise measurement of rivers was recognised by various submitters to the committee ranging from Engineers Australia to the National Water Commission's Ken Matthews:

> We do not know nearly accurately enough where the water is, what it is being used for and what its state of health is, and that is not good enough... Unless water can be monitored and measured, it simply cannot be managed. Good water accounting is vital for not only economic purposes but also environmental management and good policy formulation. [12]

3.16 The Department of Agriculture, Fisheries and Forestry explained that one of the aims of the National Water Initiative (NWI) is for all states to work towards fair and sustainable allocation of water and redress as much as possible the negative impact of over allocation:

> The over allocations are intended to be dealt with by all the states, consistent with the National Water Initiative. The National Water Initiative indicates that, if structural adjustment is required, the Australian government will consider that on a case-by-case basis. In the meantime we need to improve the information base, and we are seeking to do that.[13]

3.17 In 2005, the Murray Darling Basin Commission responded to widespread concern about the accuracy of cap measurements by commissioning an audit of cap data management systems in the basin by Marsden Jacobs Associates. The auditors

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11 Ms A. Hankinson, Inland Rivers Network, *Committee Hansard,*15 September 2006, p.61.

12 Mr Ken Matthews, *Committee Hansard,* 7 March 2006, p.3, Engineers Australia, *Submission* 8.

13 Mr Simon Smalley, (DAFF) *Committee Hansard,* 7 March 2006, p.91.

recommended the establishment of an open registry of bulk off-takes in the basin. The Commission has now established the registry and a first report on the information it gathered, known as the Bulk Off-take project report, was published in October 2006. The report found that:

> Poor measurement method selection, poor installation and a failure to audit meter installation was found to be a common contributor to measurement inaccuracy. Verification of rating tables, which are used for assessment of flows for the majority of open channel diversion sites, occurs in all states. However, it is not done according to any prescribed standard. Only New South Wales conducts in-situ verification of the accuracy of meters on conduit structures. However, this in-situ verification does not occur in all valleys, is not targeted and is opportunistic.[14]

3.18 The Bulk Off-take project report also found that:

> It is probable that significant errors are occurring in measurement in all Queensland valleys. Problems include failure to verify measurement accuracies and to update flow rate equations when channel modification occur. A comprehensive metering program is planned for the Condamine-Balonne.[15]

3.19 In relation to the Barwon-Darling in NSW, reported diversions are estimated to be 40 per cent below those actually occurring. The committee notes that those findings confirm evidence given by several witnesses to its inquiry and referred to in paragraphs 3.41 and 3.42 of this report.

3.20 There is currently no national or international method standard for the measurement of bulk water diversions. The Commission's Bulk Off-take project report identified conduit measurement as an area of particular concern with propeller meters found to have a variation in accuracy of between one to 93 per cent. The Commission has asked all the states to report by March 2007 on how they propose to improve the accuracy of off-takes identified as having an unacceptable level of inaccuracy.

3.21 There are great technological advances being made in the area of real-time metering and monitoring of water use.[16] The committee urges all the states involved to take urgently all the steps necessary to improve the accuracy of reported water diversions from the river. This is a crucial issue for the long-term health of the Murray.

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14 MDBC, Improvement in accuracy of measurements of diversions and returns under the cap, October 2006, p.ii. http://www.mdbc.gov.au/nrm/the_cap/Improvement_in_accuracy_of_measurements_of_diversions_and_return_under

15 As above, p.iii.

16 NSW Irrigators, *Submission* 45, p.7, CSIRO, Water for a Healthy Country Newsletter, April 2006.

## The Living Murray initiative

3.22 In recognition of the serious implications for the river's health and the survival of its communities and their economies, the MDB Ministerial Council (comprising the federal minister, together with ministers from New South Wales, Victoria, South Australia, Queensland and the Australian Capital Territory) established the Living Murray Initiative in November 2003. The aim of the initiative is to recover and return to the river, up to 500 gigalitres of water annually by the end of a five year programme. In its submission to the inquiry, the Department of Agriculture, Fisheries and Forestry stated that:

> Four water recovery proposals were approved by the MDB Ministerial Council in November 2004 (two from Victoria and two from NSW). These proposals will potentially recover up to 240 gigalitres of water each year at a cost of approximately $179 million. The Australian Government has indicated an interest in investing up to its maximum investment level of 40% of the costs of these projects, equating to potentially $71.6 million, with $42.7 million to be spent in Victoria and $28.9 million in NSW.[17]

3.23 In evidence, the Australian Conservation Foundation pointed to a recommendation by scientists that about 1,500 gigalitres would be needed if damage to the river were to be reversed:

> Even though in many cases that has been described as an environmental allocation, the environmental allocation is not adequate to deal with the environmental needs of the system.
>
> One case in point was with the Living Murray, where the best available scientific recommendation was to recover 1,500 gigalitres for the river, and a decision was made to return 500 gigalitres to the river. Even in that instance we have made very poor progress in recovering water for the environment.[18]

3.24 CSIRO's Professor Young told the committee that the very survival of the river might be at stake:

> Conceptually, there is a base amount of water that all rivers need… Some people—and this involves some value judgements—would argue that the right way to do this, as the system gets drier, is to increase allocations to the environment so you still have a river which supplies water for recreation, for maintenance of flood plains and so forth. Alternatively, you can have a system in which, as it gets drier, we lose all of those assets.[19]

3.25 The need for a balance to be struck between consumptive use and environmental requirements in the Murray Darling Basin has been identified for more

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17 DAFF, *Submission* 41, p.17.

18 Dr A. Buchan, Australian Conservation Foundation, *Committee Hansard,* 15 September 2006, p.58.

19 Prof. M. Young, *Committee Hansard,* 7 March 2006, p.47.

than a decade.[20] Some controversy will always attach to any move to reduce water allocations to irrigators and farmers so that some water can be returned to the river. However, the committee's view is that in trying to find ways to ensure the health of the Murray and Darling rivers, everyone needs to recognise that it is unproductive to oppose 'environmental water' to 'agricultural water'. As the Murray Darling Commission states on its website, it is not just a question of sustaining the environment of the river and its aquatic ecosystems, "virtually all economic activity within the Basin" is at stake.[21]

**Recommendation 5**

**3.26 The committee recommends that all state jurisdictions in the Murray-Darling Basin undertake a review of the current water allocations with a view to reducing diversion from the river.**

## The Condamine–Balonne catchment

3.27 More than a third of those who made submissions to the inquiry were farmers suffering from the effects of over allocation in northern New South Wales and Queensland. They expressed their concern and frustration about the parlous state of the lower reaches of the Birrie and Bokhara rivers, the Culgoa, Condamine-Balonne and the Lower Balonne flood plains.

3.28 Mr Ed Fessey, a member of the Lower Balonne Floodplain Graziers Association, described the impact water over allocation is having on downstream families and communities, in the following way:

> Basically the unsustainable and irresponsible over allocation of water in the Lower Ballone has had a profound effect on many families. My submission details the cost of providing alternate water supply and the average loss on income – grossed up over a 10-year period to some $450,000. The alternate water system cost us $104,000 to replace and we are still paying that off, with no subsidy from the government. I know of 27 other businesses which have had similar problems. This is largely due to the reduced income and reduced river flows in the Lower Balonne.[22]

3.29 Robert and Ann Senior, landholders from the Brewarrina district, told the committee that their property – originally purchased some 50 years ago for its beneficial flooding – is struggling even to get stock water:

> Our floodplains country is totally dead and our trees are dying at a rapid rate. Before the development of the irrigation our country was flooded on

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20 Toyne, P. "Water use and environmental flows in the Murray-Darling Basin" in Proceedings of the Water Use and Environmental Flows Workshop, 22-23 August 1995. Murray-Darling Basin Commission, Canberra.

21 Murray Darling Commission, The impact of water regulation and storage on the basin's rivers, http://www.mdbc.gov.au/nrm/water_issues/impact_of_water_regulation_and_storage

22 Mr Ed Fessey, *Committee Hansard*, 16 August 2006, p. 4.

> an average at least once every 12 months, even in the past receiving some beneficial flooding during drought years.[23]

3.30 Another witness called for a moratorium on floodplain harvesting:

> **Mr Treweeke**—Basically, to do away with flood plain harvesting. As we have said, that is the inequitable portion of this. It cannot be measured accurately and it has allowed people to gazump others who are legitimately in a queue in a process sanctioned by the water act at the time. I think that if that were removed and proper environmental studies done of the impact of water extraction, it would help.[24]

3.31 Graziers from the area argue that, even when the drought situation in their region over the last 10 years is taken into account, the lower reaches of those rivers on which they depend are being destroyed as a result of over allocation of the water available to irrigators 'upriver'. Mr Fessey, pointed out that even when there is more rainfall in the area than there was 25 years ago, the Lower Balonne river and its floodplain are now drier because of the large amounts of water that are being diverted upstream, especially in times of flood because of an erroneous assumption that water flowing over the banks is wasted if it is not stored.[25]

3.32 Access to overland flow water has been granted to the irrigation industry generally with no requirement that it be metered or accounted for in any way (and free of charge in Queensland), further encouraging the building of off-river storages, the numbers of which have grown exponentially since the mid-eighties.

3.33 The following graph from Professor Kingsford's submission illustrate the dramatic increase in the number of private dams and in dam storage capacity in the Condamine-Balonne catchment area.

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23 *Submission 10,* Mr Robert and Ms Ann Senior, p. 1.

24 **Mr Rory Treweeke,** *Committee Hansard*, 16 August 2006, p. 15.

25 Mr Ed Fessey, *Committee Hansard,* 16 August 2006, p. 5.

## Growth in off-river storage in the Condamine-Balonne catchment area

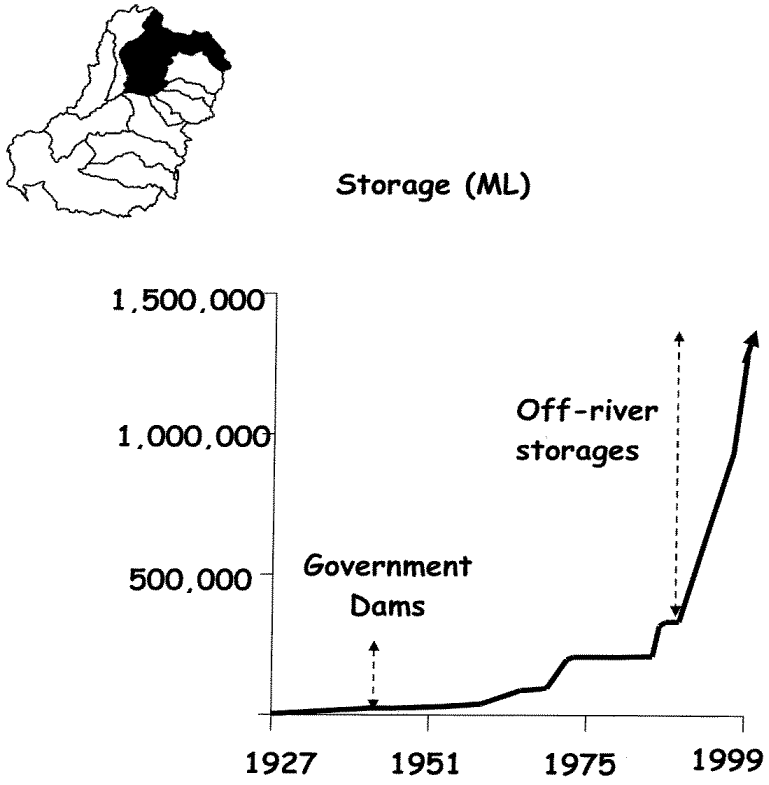


**Fig. 4**. Cumulative storage capacity of dams in the Condamine-Balonne catchment of the Murray-Darling Basin, showing the cumulative capacity of Government built dams relative private off-river storages.

*Provided by Prof. Richard Kingsford, (Uni.of NSW), Submission.9, p.7*

3.34 The situation of the northern NSW floodplain farmers who made submissions to the committee is mirrored in the lower reaches of the Murray river where according to the South Australian government submission:

> Drought-like flows are now experienced in the lower reaches of the River Murray 60 per cent of the time, compared with 5 per cent before river regulation and development.[26]

3.35 Diversion of flood waters to storage for irrigation has an economic and social impact not only on floodplain farmers and the communities in which they live but also on the original dwellers of the floodplains, the indigenous peoples of the river area.

## Impact on local indigenous peoples

3.36 Several submissions and evidence from graziers in the Lower Balonne area referred to the negative impact of reduced or no river flow on the indigenous people of

26 SA Government, *Submission* No.52, p. 10.

the area. Mr Edward Fessey who leases 'Weilmoringle Station" from the Indigenous Land Corporation of the area had this to say:

> The Muruwari community, who live there, consider the river to be the most important feature of this land. They are deeply disappointed and angered at the way the river has been changed to such an extent that they can no longer even rely on it for water for their community. The prospect of a flow in the river causes much excitement and gives the people a spirit of renewal as the fish start to come up from the Darling River.[27]

3.37 This view was supported in evidence to the committee by Mr Steven Ross of the Wamba Wamba people from southern New South Wales and the coordinator of the Murray Lower Darling Rivers Indigenous Nations (MLDRIN):

> one thing MLDRIN, and the confederated traditional owners within MLDRIN, always push is that the health of the river is definitely connected to the health of the people. The Yorta Yorta have that in their Dreamtime stories: they believe that Lake Barmah and Lake Moira act as kidneys for the river and actually clean the water as it goes through those ecosystems. Western evidence also shows that when water goes through the Barmah Choke it comes out much cleaner at the other end. The Yorta Yorta relate that to the health of their own people.[28]

3.38 He welcomed the provision under the National Water Initiative that allows water to be allocated to native title holders although the capacity for traditional owners to gain access to native title is limited in southern New South Wales, Victoria and South Australia. Mr Ross called for a holistic approach to river management that recognises what traditional owners do for the protection of rivers and things that they would like to see done such as "resnagging, reforestation and protection of Indigenous sites. [29]

## The floodplain as part of the river

3.39 In his submission to the committee, Professor Richard Kingsford of the University of NSW explained that the way a river was perceived and defined when the first water legislation was being developed last century made it impossible to consider the floodplain as part of the river:

> Most of Australia's legislation for river was derived from English legislation where rivers are considerably different. So until relatively recently most of Australia's legislation, policy and management left out floodplains, the vast majority of a river. In NSW, floodplains equate to about 88% of a river's area and more than 95% of this is owned by landholders who will be affected by changes in river flows.[30]

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27 Mr Ed Fessey, *Submission* 20, p.1.

28 Mr Steven Ross, *Committee Hansard* 15 September 2006, p.54.

29 Mr Steven Ross, *Committee Hansard* 15 September 2006, p.51.

30 Professor Richard Kingsford, (University of NSW), *Submission* No.9, p.5.

3.40 Professor Kingsford's argument is that the overflow is essential to the survival of the river downstream, its floodplains and wetlands and the floodplain landowners whose livelihood is based on receiving the occasional flood. Water that infiltrates into the flood-plain contributes to aquifer recharge which also ultimately impacts on downstream flow. In a joint submission to the committee, the Australian Conservation Foundation and Inland Rivers Network stressed the importance of including overland flow in river protection:

> Overland flow is linked to downstream river flow. It makes an important contribution to natural flow variability and the connectivity of floodplains with river channels. Harvesting overland flow for storage and subsequent irrigation use has huge implications for downstream river and wetland health, as well as on downstream users, and must be addressed immediately. Immediate resolution of this conflict is needed to provide greater certainty and fairness to non-irrigation water users and the environment.[31]

3.41 Inland Rivers Network was very critical of the water management situation on the floodplains of New South Wales:

> In a recent release of environmental water in the Macquarie Marshes, there were a number of photos taken that actually demonstrate water being siphoned off, through channels and well-placed banks into ring tanks and large storage dams, and down channels to go across other paddocks. That is water that has come directly from the wetland during this specific release of environmental water.
>
> …As far as I am aware, none of the departments have made moves to investigate this further. There has been a public statement from the Department of Natural Resources that they are investigating it, but I spoke to their compliance department and they said they had no real idea of what was happening.

3.42 On the Queensland front, Ms Moles from the Toowoomba and Region Environment Council had this comment about compliance:

> On the matter of compliance, the environment movement believes that compliance is not taken terribly seriously by governments. I have personally heard a lot of people—not just graziers but also some irrigators—complaining about water being stolen. Obviously, I do not know whether or how much of these allegations are true, but there is a widespread belief out there that the penalties for breaching licence conditions are a 'joke', 'totally inadequate' and 'a trifling business expense' and that a much more effective tool for ensuring compliance would be a reduction, perhaps temporary, in one's water allocation.[32]

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31 *Submission* 38, ACF & Inland Rivers Network, p.6.

32 Ms Sarah Moles, *Committee Hansard,* 2 August 2006, p.62.

3.43 The committee believes that state governments have a greater role to play in the management of the flood plains, unregulated rivers and streams in their jurisdictions. While not all the banks and channels referred to in evidence have been built illegally, the relevant jurisdictions have a responsibility to police the construction of illegal banks and levees and to ensure that when environmental water is released, it reaches the wetland, such as the Macquarie Marshes cited above, for which it is intended and not diverted illegally for other purposes. If this is not policed, taxpayers' funds used to regain water for the environment would have been wasted.

**Recommendation 6**

**3.44 The committee recommends that state governments take whatever steps necessary to ensure the removal of privately-built levees and interceptor banks from the flood plains to allow environmental water to flow to the wetlands for which it is intended.**

3.45 Several submitters expressed concern at the impact of large-scale irrigation on the Gwydir and its wetlands in north west NSW. The Gwydir Wetland is recognised internationally under the Ramsar Convention and also in the China/Australia Migratory Birds Agreement (CAMBA) and the Japan/Australia Migratory Birds Agreement (JAMBA). Of 235 different species of birds recorded in the Lower wetlands alone, some 134 use the area for breeding. In a wet year (1998) as many as 500,000 birds were recorded in the area. In 1999, a group of private landholders in the area together with representatives of WWF—Australia and the National Parks Association signed a Memorandum of Understanding with the Commonwealth and NSW government ministers responsible for future cooperation and management of a portion of the Lower Gwydir Wetland - a first for NSW. Some of those private landholders made a submission to the inquiry pointing to the failure of both governments in honouring their commitment to maintain appropriate flows and assist them in managing issues such as weeds. The MOU stated in part:

> Both Governments remain committed to maintaining appropriate hydrological regimes in the Gingham and Lower Gwydir Watercourses, particularly the provision of adequate, ecologically appropriate environmental flows to the wetlands." [33]

The landholders' evidence to the committee, referring to the MOU's commitment, was that: "These have proven so far to be hollow words."[34]

3.46 Another landholder, Ms Wendy Bunce made several submissions to the inquiry and told the committee:

> The alarming collapse of kilometres of fragile Gwydir river banks upstream of the Tareelaroi weir escalates daily and more and more regulated waters are continually released from Copeton dam regardless of the wretched

33 Mrs Terry Murphy-Fleming, Mr Phillip Fleming & Mr Howard Blackburn, *Submission 54,* p.1.

34 As above.

> (documented) destruction these regulated waters are causing to the environment. The Gwydir river is being used by the water authorities and the flood irrigation industry as a huge regulated irrigation channel and it simply cannot cope.[35]

3.47 Ms Bunce quoted a letter from WWF—Australia to the federal Minister expressing concern about the ecological integrity of the Macquarie Marshes as well as the Gwydir Wetlands and the Wilgara Wetland. Valley Ramsar. WWF called on the Commonwealth to make future funding of the Catchment Management Authorities (CMAs) conditional on plans demonstrating how hydrological prescriptions will help maintain the ecological character of those wetland and Ramsar sites.[36]

3.48 The committee notes that the Commonwealth, under its Water Smart Australia scheme and the NSW governments have now recognised that the northern NSW wetlands have been under severe ecological stress. In August 2006, both governments announced that $26.8 million (jointly-funded) had been allocated to a NSW Wetland Recovery Plan targeted at the Gwydir Wetlands and the Macquarie Marshes in particular.[37]

***Better data about rivers***

3.49 Although a substantial amount of scientific information is now available about river systems and catchments, the data is scattered reflecting the fact that the research and data collection work is being carried out by different universities, by hydrological experts, ecologists, water storage engineers and different governments. Professor Kingsford told the committee in evidence that he is working on making all the available information about river catchments available on a single website:

> For some time now, and I will only briefly describe this, one of my projects has been to collect all of the information for a catchment and make it available on a website so that people can look at a map and just find out about it. A lot of scientific information for our rivers, by the very nature of what science is, is published in international journals and it is not very accessible to most people. It is difficult, and even policy makers do not have quick access to that. So I have been trying to break down that barrier.[38]

3.50 That information is available at:

http://wiserivers.nationalparks.nsw.gov.au/Multimedia/index.html

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35 Mrs Wendy Bunce, *Submission* 59, p.7.

36 Mrs Wendy Bunce, *Submission* 59, p 9.

37 The Hon. Ian Turnbull, Parliamentary Secretary to the Prime Minister, Press Release, 18 August 2006.

38 Professor Richard Kingsford, *Committee Hansard,* 18 October 2006, p.16.

3.51 The committee commends Professor Kingsford for his work in attempting to gather all the relevant data about rivers and catchments in one database. The committee is very keen to see more data about rivers and water collected and made publicly available, so that decisions about water allocations can be based on the best available science. Data will always be incomplete, but sound decisions about flow rates, timing and the volume of water that each irrigator can depend on must be made in response to each particular ecosystem. It is important to have more accurate data on how much water each river needs for its survival and support of a flourishing riverine environment.

3.52 Cubbie station is situated on the alluvial flood plain between the Culgoa and the Balonne Minor river systems. The property currently irrigates a maximum area of 20,000 hectares with cotton as its main crop and hopes to possibly increase this to 30,000 hectares. The Cubbie group has water storage capacity totalling 537 gigalitres comprising 462 gigalitres at Dirranbandi and 75 gigalitres at St George.[39]

3.53 The water Cubbie extracts from the river is metered in accordance with Queensland government requirements but at the moment there is no requirement for flood plain extractions to be metered and they won't be measured and audited until the Water Resource Plan for the Lower Balonne system is finalised by the Queensland government, however Cubbie station has always provided this information to the department. Cubbie told the Committee in evidence that:

> Cubbie reports daily what its extractions are from the flood plain.[40]

> The water that we do take off the flood plain… enters the system via pumps or pipes. You know what those pumps pump. There are head drop tables that apply to every pipe structure so you know instantaneously and on a daily basis the volume that is being diverted. [41]

3.54 Referring to Cubbie's extractions from the flood plain, Mr Grabbe argued that some of the water flowing over the bank in times of flood is "lost" to evaporation and would be wasted if Cubbie was not intercepting it and storing it:

> The volume of water that Cubbie takes off its flood plain is equivalent to the volume that would be naturally consumed within its levee area—that is, where we have constructed our scheme was a total flood plain…. The amount of water we divert is the water that would have naturally been lost in that area if the levees were not there.

3.55 Referring to the 2004 flood event, he further stated:

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39 Mr Paul Brimblecombe, *Committee Hansard*, 2 August 2006, p.17-18.

40 Councillor Buchan, *Committee Hansard*, 2 August 2006, p.21.

41 Mr John Grabbe, *Committee Hansard*, 2 August 2006, p.27.

> If our system of levees did not exist, those 45,000 megalitres would not have gone anywhere. It would have been naturally consumed by the flood plain where our levee system sits.[42]

3.56 The Cubbie Group also stated in its submission that it can prove that the impact of its floodplain water harvesting on downstream flood plain flow is zero:

> Cubbie can show by measurement and by physical inspection that the volume of water that it consumes (harvests) from its floodplain is equivalent to the volume that would be naturally consumed by the three naturally occurring forces (seepage, evaporation and natural residual pools along the floodplain.) In other words the impact on downstream floodplain flow by Cubbie's station floodplain harvesting is zero.[43]

3.57 However, in response to questions from committee members, Cubbie station's managers acknowledged that the water contribution from the flood plain to the aquifer is not known currently so they were unable to quantify at all as there has been no study.[44]

3.58 The committee wants to make it clear that it is not suggesting that Cubbie has done anything illegal or improper by installing pumps and building levees, retaining walls and water storages to harvest water from the flood plain. Nor is the committee challenging the quality of the river water downstream from Cubbie's water storages. The committee recognises that Cubbie allows enough water to flow in the river to maintain water quality and for the river's biodiversity to be maintained. The same cannot be said of the flood plains, which according to Professor Kingsford, equates in NSW, to about 88 per cent of a river's area.[45]

3.59 Under the National Water Initiative, the approved volume of water that can be extracted from any river is set in the Water Resource Plan for each area. The plan is a statutory document. As stated in paragraph 3.58, Cubbie operates within the Queensland Water Act 2000. Queensland is a signatory to the National Water Initiative and is working on developing Water Resource Plans for each of its irrigation areas. The final WRP for the Condamine- Balonne was gazetted on 12 August 2004.

3.60 Resource Operations Plans (ROP's) are the mechanism through which the Water Resource Plans are implemented. ROPs define water entitlements, entitlement performance measures and establish water trading. In Queensland, they are currently being developed through a process of consultation carried out by Ministerial Advisory Councils that advise the Queensland Minister for Natural Resources and Mines.

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42 Mr John Grabbe, *Committee Hansard* 2 August 2006, p.41.

43 Cubbie Group Ltd. *Submission* 55, p.2.

44 Mr John Grabbe & Mr Brimblecombe, *Committee Hansard* 2 August 2006, p.18.

45 Prof. Richard Kingsford, UNSW, *Submission* 9, p.4-5.

3.61 A large number of flood plain land holders in New South Wales, downstream from the Balonne river, depend on Queensland Water Resource Plans and associated ROPs to ensure that they receive a share of water in order to continue sustainable farming on the flood plains. In submissions to the committee's inquiry, several of those stakeholders expressed concerns that their views and interests could not be fairly represented to the Queensland Minister by the Chair of the Ministerial Water Resources Advisory Council. A number of landholders in the area felt so strongly about the issue that they withdrew from the consultative process. The minority that did not participate expressed the view that:

> All NSW landholders and many Qld landholders have refused to participate in the Ministerial Advisory Council for the Resource Operations Plan on the Lower Balonne as we believe the appointed chair is not financially or geographically independent of the system and that we will not get fair representation.[46]

This view is disputed by many others involved with the council.

3.62 The Chair of the Ministerial Water Resources Advisory Council had also been the chair of the Lower Balonne Community Reference group (CRG) which had made a submission on behalf of that area to the Queensland minister when the Water Resource Plans (Condamine & Balonne) was being developed in 2004. It is imperative that people who chair consultative committees are seen not to have a conflict of interest.

3.63 In evidence to the Committee, Mr Ed Fessey explained that in spite of the withdrawal of the non-irrigators, the representatives of environmental groups and some of the indigenous groups from the consultative process:

> The process is ongoing. They are still holding minuted meetings and subcommittee meetings to determine the flow rules and the flow operation rules.[47]

3.64 When the committee brought to her attention the complaints about the MAC's Chair lack of impartiality and the possible conflict of interest, the Chair responded that:

> Every member of the Lower Balonne Water Resource MAC has a vested interest in the management of water resources in the Lower Balonne. In order to ensure that members, the community and the Minister are aware of those interests a register of interests is kept.
>
> The Council is advisory only as it is clearly recognised that it would be inappropriate to devolve to a local community the decision making

46 Rick & Helen Hall, *Submission* 19, p.1.

47 Mr Ed Fessey, *Committee Hansard,* 16 August 2006, p.10.

responsibility for sharing a scarce resource. It is not the only mechanism for providing advice to the Queensland Government.[48]

## Diverting water from the flood plains

3.65 In the Australian context, diverting floodwater before it reaches the lower flood plains has a massive impact on agriculture, the wetlands and ecosystems and every aspect of the life of the communities living downstream. Many of the flood plain landholders who have made submissions to the committee's inquiry are facing financial hardship and in some cases, possible ruin as a result of water being diverted away from the flood plains. For some, even water for their daily needs is threatened and they face having to abandon farming in areas where their families have farmed for generations. Many express feelings of frustration at being cheated by a system over which they have no control.[49]

3.66 The evidence to the committee from the flood plain farmers further downstream points clearly to the fact that in addition to the lack of water they experience because of the prolonged drought, they have experienced severe hardship through having the overland flows that they were used to experiencing cut off.

3.67 There is currently no requirement for flood plain extractions to be metered, a failure identified since 2000 as having a big impact on extraction levels on the rivers in the Murray- Darling Basin since in NSW, the flood plains equate to about 88% of a river's area.[50] The MDB Commission's CEO told the committee that the Commission is now taking steps to develop a system for measuring flood plain harvesting.[51] The committee welcomes this initiative since the measurement of flood plain harvesting is essential, not only for the long term viability of the rivers and their aquatic ecosystems, but also for the viability of almost all economic activity within the Basin.

3.68 The committee's strongly held view is that interference with the natural flooding regime of the Lower Balonne system has had a severe effect on some 1.2 million hectares of flood plain on which the dryland farmers, graziers and indigenous people of the area depend. [52] Of even greater concern is the fact that the real ecological damage may not be known for several decades. In that context, the committee notes Professor Peter Cullen's often quoted remark urging the cautionary principle in the face of inconclusive scientific evidence on environmental matters: "by the time you get the science right, the patient is dead".

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48 Mrs Leith Boully, Correspondence to the Committee, Jan. 2006, Tabled document.

49 *Submissions* Nos. 16, 19, 20 26 & 29.

50 Prof. Richard Kingsford, UNSW, *Submission* 9, p.4 -5.

51 Dr Wendy Craik, CEO, MDBC, *Committee Hansard*, 12 October 2006, p.16-17.

52 Mr Fessey, *Committee Hansard*, 16 August 2006, p.4.

3.69 The Condamine-Balonne has more wetland and flood plain (around 1.2 million hectares) than any other catchment within the Murray-Darling Basin. According to one view expressed by Professor Richard Kingsford, a lot of the vegetation on those flood plains is threatened because of the amount of water that is being taken out of the flood plains. In his view, the "real impacts" will take time to be documented:

> You have to imagine that a lot of the plants and animals that we have on the river system have had tens of thousands of years to evolve to not getting a flow every now and again, so it takes them a long time to die. [53]

3.70 The committee's is aware of the moratoriums now in place in the Condamine-Balonne and Border Rivers catchment that place holds on all new applications for water licences and prohibit the commencement of new works for the taking and interfering with water, including overland flows. The committee notes also that the Condamine-Balonne Water Resource Plan makes provisions for "the regulation of the take of overland flow water through the catchment ensuring more water for the environment and downstream users."[54]

3.71 While it is commendable to make provision for regulation of the overland take, the committee's overwhelming concern in this matter is that the current levels of irrigation and the volume of water diverted from the rivers and flood plains from the Condamine-Balonne catchment has been claimed to be unsustainable. In making the recommendation that follows, the committee wishes to stress that it is essential for its proper implementation that the granting of licences should only happen after (and not before) the current levels of water extraction from the flood plains have been assessed as part of the independent scientific review that it recommends and after the results of that review have been published.

**Recommendation 7**

**3.72 The Committee recommends that all state and territory jurisdictions review the levels of water diversion from the flood plains and only grant licences to extract overland water after an independent scientific review of current levels of extraction has been completed.**

***An alternative approach***

3.73 Reducing the level of over allocation from rivers and flood plains in the Murray-Darling Basin is one of the major goals of the National Water Initiative. Some irrigation areas in both New South Wales and Victoria have already faced issues of

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53 Prof. Richard Kingsford, *Committee Hansard*, 18 October 2006, p.15.

54 MDBC, Water Audit Monitoring Report 2004-2005, Report of the Murray Darling Basin Commission on the Cap on Diversions, June 2006, p.39.

sustainability and seen their water licences re-allocated to different crops than the one for which the licence was obtained originally.

3.74 Historically, incentives in the tax system have encouraged growers in some areas to plant cotton on a large scale by reason of the tax deductability of the capital infrastructure involved. They are now facing a depressed cotton market and reduced water availability. The committee's view is that it would benefit many of the growers and help address the current problem of water over allocation from the flood plains, if an incentive package were put in place that would ensure the continuing prosperity of irrigation areas while giving cotton growers an opportunity to diversify into less highly water-reliant crops.

3.75 Such a package would require amendments to the *Income Tax Assessment Act 1997* and to the *Managed Investments Act 1998* to make it more attractive to invest in a range of crops that are known to need less water per acre. It would require for instance that, instead of a situation where the Managed Investment Scheme (MIS) applies as a general exemption as it does currently, access to the MIS scheme would only be available if specific crops (whether peanuts or horticultural crops) and specific irrigation methods (for example, trickle irrigation) and farm management methods were used.

3.76 A balance needs to be found between ensuring the long-term sustainability of the regional economies dependent on cotton and the sustainability of the rivers and flood plains. The test of whether an incentive scheme was successful would be whether a substantial amount of water was being returned to the river and the flood plains and whether the continuing prosperity of those regional areas that are built around large-scale irrigation is guaranteed through the planting of high-value crops. The potential return to the Australian economy from exporting those crops would also need to be taken into consideration.

3.77 The committee urges the Australian government to investigate the beneficial trade-offs that could be devised through tax incentives and other related measures such as the MIS, to encourage growers to move away from planting cotton in the Murray-Darling Basin alluvial plains that are currently over allocated. Growers would have a choice of whether to access the tax benefits available under the scheme by moving to alternate crops or to remain with the status quo.

**Recommendation 8**

**3.78 The committee recommends that the Australian government consider putting in place incentives and initiatives to encourage growers and irrigators to move into alternate crops that allow for a substantial amount of water to be returned to the rivers and flood plains of the Murray-Darling Basin.**

## Groundwater

3.79 As it becomes more costly and more difficult to meet the growing demand for water from surface water resources, both rural and urban users have turned to

pumping groundwater as a way to solving water shortage problems. While in some states some of those bores are licensed, very few of them are metered, making it extremely difficult to track levels of extraction and develop data on sustainable yields. There seems almost to be an implicit assumption that groundwater is limitless. The reality is that groundwater is not available in addition to surface water and in many cases, extraction from one source may be leading to the depletion of the other.

3.80 While great progress has been made in hydro-geology in recent years, it remains a complex and inexact science. Although it is known that some aquifers are connected to streams, there is limited knowledge about the exact interaction between surface and ground water in many areas, and we lack long-term data on the effects of groundwater pumping on the sustainability of our aquifers.

3.81 CSIRO and the Murray Darling Basin Commission have identified groundwater extraction as one of the six significant risks [55] facing the Murray-Darling Basin that could eventually reduce the amount of water available in its rivers and streams. The paper quoted estimates of current losses of 327 GL of water from the basin because of groundwater pumping and studies that predicted a further reduction of 253 GL by 2012/13. The committee notes also the 2003 report by Sinclair Knight Merz which has estimated an average reduction in surface flow of 600ML for every 1000 ML of groundwater use.[56]

3.82 It is of even greater concern that scientists are warning that, in addition to the immediate negative impacts on surface flows and groundwater stores, the long term impacts of sustained groundwater extraction may be of greater consequence:

> In connected groundwater-surface water systems, there is normally a time lag of years or decades between the start of groundwater extraction and the moment the full impact of that pumping is felt in the streams…even if all groundwater pumping were to cease immediately, there will be an ongoing impact in streams due to historical pumping.[57]

3.83 The Murray Darling Basin Commission's 2004-2005 Water Audit Monitoring Report shows that the Commission is finally implementing the Ministerial Council's August 2000 decision to develop a Groundwater Management Strategy and integrated reporting framework for surface and groundwater. The Audit report quotes some worrying figures:

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55 Van Dijk, A., Evans, R., Hairsine, P., Khan, S., Nathan, R. Paydar, Z., Viney, N. and Zhang, L. (2006) Risks to the Shared Water Resources of the Murray-Darling Basin. *Murray- Darling Basin Commission Report*, Canberra, p.6.

56 Sinclair Knight Merz, Projections of groundwater extraction rates and implications for future demand and competition for surface water. Report to Murray-Darling Basin Commission, Canberra 2003.

57 Van Dijk, A. and others (2006), *Murray- Darling Basin Commission Report*, Canberra, p.19.

> The estimated sustainable yields in Groundwater Management Units (GMU) of the Basin are reported to be 1534 GL (note Victorian SY values are not available). Out of this, 2950 GL was already allocated in 2004/05, which constituted 192 % of SY. The total usage of groundwater in the Basin was 1490 GL, which was 51% of allocation and 97% of SY.[58]

3.84 The committee is aware that not all allocations are in use at the present time but those statistics tell of a continuing story of unsustainable allocation in the basin. The committee urges all state governments involved to review groundwater allocations in the MDB. It is also imperative that those governments exercise the utmost caution in granting licences for groundwater extraction in cases where little is known about the aquifer in question. The data available is improving greatly and it is important to assess what the sustainable yield is before granting access to any aquifer.

**Recommendation 9**

**3.85 The committee recommends that all state and territory government signatories to the Murray-Darling Basin Agreement undertake a review of groundwater allocations in the basin with a view to bringing back allocations to a sustainable level.**

## Protecting Northern Rivers

3.86 As discussed earlier in this chapter, many of the river systems in Australia are over-allocated and degraded, suffering from the excessive demands brought about by their proximity to our agricultural and residential zones. Fortunately, this is not the case for the rivers in Australia's tropical and semi-arid zones. Australia's northern rivers have the advantage of not being in heavily populated areas compared to the Murray. The Northern Territory has some 140,000 kilometres of rivers and creeks that are identified as being largely undisturbed.

3.87 Various submissions to the committee called on governments to agree to grant special protection to those rivers that are still in a relatively pristine condition to ensure that they do not suffer the fate of the Murray. Environment Centre, NT Inc. expressed concern about pressure for the granting of water licences in the Daly River catchment in the Top End:

> The catchment has long been targeted for large-scale irrigated agriculture and more intensive pastoral activity, which would involve increased surface and ground water extraction and native vegetation clearing. In late 2003 a moratorium on land clearing…was imposed by the NT Government.
>
> There is no official moratorium on water licence approvals however. There are currently 79 applications for a total of 51,655 Megalitres per annum (by 2010) currently being assessed by the NT Government (NT Government:

58 MCDC, Water Audit Monitoring Report 2004/05, p.63. http://www.mdbc.gov.au/nrm/the_cap/wam_reports

> *pers. comm*. 17/01/06). Should these be approved, this would result in a threefold increase in approved water extraction from the catchment by 2010, compared to the approved level in 2004.

3.88 WWF–Australia also called for greater protection for the northern rivers through the establishment of an Australian heritage river system:

> For a relatively small amount of money, the Commonwealth along with the states, territories and catchment groups could really leave a great legacy of these assets for decades and centuries to come.[59]

3.89 In evidence to the committee, the Northern Australia freshwater manager for WWF–Australia, Dr Stuart Blanch warned that it was important to hold back from taking decisions about rivers and aquatic systems in the north until more data had been collected:

> One of the knowledge gaps we have is: how can you trade water in these rivers when they are dry for six months of the year and for another three months of the year there is too much water and everyone has to leave and go to Darwin? There is lot of knowledge to be gained about that. The legal frameworks in the north are generally pretty underdeveloped compared to the south. We certainly could fill up a decade of knowledge by just mapping all the wetlands and where the groundwater is. A lot of that is not known.[60]

3.90 The Committee supports the development of management plans, based on research and community consultation, that ensure that the northern rivers that are in natural or largely natural condition are adequately managed with a view to protect their pristine ecosystems and to safeguard them from the over-allocation problems that are proving so difficult to resolve in the Murray-Darling Basin.

**Recommendation 10**

**3.91 The committee recommends that Commonwealth, State and Territory governments should identify and protect all high conservation value aquatic ecosystems by 2010.**

**Recommendation 11**

**3.92 The committee recommends that water plans be developed in line with the National Water Initiative to prevent the over-allocation of water in rivers that are in a natural or largely natural condition.**

## Northern Australia Irrigation Futures

3.93 While the south and east of the continent has been experiencing severe long-term drought, there has been plenty of rain falling in the north of Australia where

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59 Dr Blanch, *Committee Hansard* 15 September 2006, p.8.

60 As above, p.12.

tropical rivers discharge about 70 per cent of the nation's available fresh water. The committee received submissions suggesting ways of tapping into the water available in the north and transporting it to the south-eastern states where the majority of the people and farms are located.[61] However attractively simple such an idea may sound, it is not workable in practice.

3.94 In anticipation of increased pressure for large scale irrigation schemes to be established in northern Australia, the Australian government, through the National Programme for Sustainable Irrigation has established the Northern Australia Irrigation Futures project to examine whether irrigation should occur in that part of the country and if so, where it should be located and how it should be managed? In addition to the Commonwealth, partners in the project include the Northern Territory, Queensland and Western Australian governments, CSIRO and the CRC for Irrigation Futures. In its submission to the committee, DAFF explained that the project had three components:

> a Sustainability Framework to support more robust debate and improved decision making regarding if and where to irrigate in tropical Australia;
>
> Tropical Groundwater Systems research that focuses on developing improved understanding of water in the tropics, particularly tropical groundwater systems and likely risks to groundwater and connected surface water systems if used for irrigation; and
>
> Irrigation Mosaics research into developing a conceptual understanding of the differences between traditional large scale irrigation systems and mosaics involving irrigation of smaller discrete patches of land dispersed across tropical landscapes.[62]

3.95 The project was launched in 2003 and stage 2 is now underway. In stage 2, a review of the institutional frameworks from the Daly, Ord and Burdekin irrigation areas has been undertaken and the findings compared. A study of tropical groundwater systems and their interaction with surface water systems is also being carried out. The scientists involved are aware that traditional irrigation practices are unlikely to work in the tropical north and are exploring the use of the irrigation mosaics approach.

3.96 The committee supports the work of the Northern Australia Irrigation Futures project as an important addition to the options that need to be explored in the quest to adapt to climate change and the consequent decrease in the water resources available in the populous and heavily farmed south-east of the country. The committee believes however, that an audit of the freshwater resources and of the land available for agriculture in Northern Australia needs to carried out before decisions can be made about the feasibility of establishing further irrigation schemes up north.

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61 *Submissions* 14, 62.

62 DAFF, *Submission* 41, p.35-36.

3.97 As discussed earlier in this report, it is proving difficult to bring together the valuable information being gathered by the many research projects relating to climate science, water resources and water and irrigation management around the country. The committee believes that it is important to bring responsibility for funding and disseminating information about all those activities within one portfolio.

**Recommendation 12**

**3.98 The committee recommends that an audit of the freshwater resources and of the land available for agriculture in Northern Australia be carried out as part of the Northern Australia Irrigation Futures project.**

**Recommendation 13**

**3.99 The committee recommends the creation of a federal Ministry for the Future that would bring together the areas of climate change and water resources.**

# Chapter Four

## Adapting to Climate Variability

### The impact of reduced rainfall

4.1 The current severe drought has highlighted the impact of reduced rainfall on the sustainability and security of our water resources. The situation is particularly difficult in the eastern and south-eastern states where the majority of Australians live and water use is high. Whether the drought is considered to be part of the recognised cycle of climate variation or the direct result of climate change, the implications for the Murray Darling Basin are significant and the long-term predictions of climate experts paint a pessimistic picture. Studies by the International Panel on Climate Change (IPCC) show that water flows in the MD basin could fall by as much as 35 per cent by 2050. Associated rainfall scenarios predicted by CSIRO show decreases of 0-8 per cent by 2030 and 0-20 per cent by 2070 for much of Australia. These forecasts also include temperature increases of between 0.8 -3.9°C by 2050 and 1.0- 5.9°C in 2080, which means increased evaporation from the rivers.[1]

4.2 CSIRO's Professor Michael Young told the committee that there is at least a two to one relationship between decline in rainfall and water availability from run-off:

> As a rule of thumb, if you have a decline in rainfall, normally the decline in water available for use is roughly twice the reduction in rainfall A 15 per cent reduction in rainfall, which is what a lot of people are talking about, means a 30 per cent reduction in yield… This is a general rule of thumb; you would need to run the models everywhere. [2]

4.3 Professor Young's estimate has proved to be very conservative in the light of the experience in southern Western Australia (including the Perth region) where a threefold reduction in run-off has been experienced in the past 30 years. The CEO of WA's Water Corporation, Dr Gill told the committee:

> There has been a phenomenal shift of climate and weather in the south of WA and it does appear to be unique worldwide… there seems to be no other place that is drying quite as fast as the south of Western Australia… We have had to cope with that over the last 10 years. It has been a trend, we now know with the best of hindsight, for about 30 years.
>
> For the last eight or nine years the rainfall has been down by about 21 per cent on what it was up until 1974, and the run-off has been down by 64 per

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1 *Submission* 40, CSIRO, p.9.

2 Prof. Michael Young, (CSIRO), Committee Hansard, 7 March 2006, p.48.

> cent. Actually now it is becoming clear that for the last four or five years, since 2001, we seem to be down still further. [3]

4.4 In such a situation, it becomes crucial to manage the water available so that it yields the maximum benefit to all water users, regardless of location. The Western Australian government and its agencies, including the WA Water Corporation, have made some progress towards achieving a balance between urban and rural water needs, in part because they have had the benefit of good climate decision-making tools developed through the Indian Ocean Climate Initiative (IOCI), funded by the WA government since 1998.

## Monitoring drought

4.5 The committee was fortunate to attend a demonstration of the National Agricultural Monitoring System (NAMS), a drought monitoring system developed by the Bureau of Rural Science (BRS) in collaboration with the Bureau of Meteorology and CSIRO. Although developed with the aim of streamlining decisions in the Exceptional Circumstances process, the NAMS has the potential to be applied to a wide range of uses in the process of adaptation to a drier climate. It contains climatic and production information for dryland and broadacre industries for over 600 regions throughout Australia and can be developed for other agricultural sectors. The committee sees a need for a decision-making tool such as the NAMS to be developed to its full potential so that it can be of benefit to a wide range of agricultural industries. The committee urges the Minister for Agriculture, Fisheries and Forestry to make funds available to BRS and its partners to facilitate further development of the NAMS.

4.6 While recognising the valuable information provided by IOCI to the Western Australian government, the committee is concerned that not enough climate forecasting and rainfall prediction information is currently available to decision-makers in other parts of southern and eastern Australia. As a result, it is not yet possible for the potential impacts of climate change to be factored into water entitlements and management plans. CSIRO stated in its submission:

> Current water allocation systems do not take into account the state of the art in climate forecasting methods and therefore it is often not until the irrigation season is well underway that irrigators have any idea of how much water will be available. Thus there is considerable risk associated with planting and crop establishment decisions, and therefore there is a need for climate forecasting tools aimed at risk management. [4]

4.7 In its submission to the inquiry, the Bureau of Meteorology also argued for "ongoing investment in basic meteorological and related data systems and in the

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3 Dr James Gill, Water Corporation of Western Australia, Committee Hansard, 16 August 2006, p.19.

4 *Submission* 40, CSIRO, p.9.

science and technology that will ensure best use is made of the data." [5] Among the Bureau's initiatives is a new coupled climate model for generating seasonal to inter annual climate predictions called POAMA (Predictive Ocean Atmosphere Model for Australia). POAMA is based on mathematical representations of the interactive physical and dynamical processes of the atmosphere, ocean and land surface domains that together control climate variability.

4.8 There is a need for projects like POAMA to be adequately funded as part of the Australian Climate Change Science Programme to which the Australian government through the Department of Environment and Heritage and the Australian Greenhouse Office has committed $30.7 million over four years to 2008. The programme supports research for:

- addressing key knowledge gaps about drivers of change in the climate system relevant to Australia;
- determining climate changes at the regional scale and the causes of these changes;
- further developing Australia's world class climate modelling capacity to reduce uncertainty and more accurately simulate past, current and projected climate;
- investigating how climate change will affect frequency and intensity of extreme events such as heat waves, cyclones storm tides fire risk and drought *and*
- developing more reliable and more comprehensive regional climate change projections for Australia, including for use in impact and adaptation studies.

4.9 The following climate science projects are also currently underway and focus on the task of predicting rainfall and water availability:

- the Australian Community Climate Earth System Simulator (ACCESS) project. ACCESS is developing a mathematical model of the earth's climate system to provide more detailed and accurate predictions of the Australian climate over forthcoming seasons. It will also enable climate projections for several decades ahead. ACCESS is being developed by the Australian Bureau of Meteorology and CSIRO with support from the Australian Greenhouse Office.
- the South East Australian Climate Initiative, (SEACI) project. SEACI is a $7 million research partnership between CSIRO, Land and Water Australia, the Murray Darling Basin Commission, the Australian Greenhouse Office and the Victorian Department of Sustainability and Environment.

5 *Submission* 42, Bureau of Meteorology, p.4.

4.10 The committee believes that in a country with high levels of climate variability like Australia, it is of the utmost importance to encourage more climate research. In its submission to the committee, the Bureau of Meteorology quoted research findings that an estimated $600 million to $1200 million were saved by the grazing industries alone in the years 1991/92 to 2002/03 because their farm management decisions were based on improved seasonal climate forecasting.[6]

4.11 The committee notes that water resources and climate change will be on the agenda for the next COAG meeting (a decision taken by the participants at the Southern Murray Darling Basin summit on 7 November 2006). The committee welcomes the fact that COAG's policy makers will have the benefit of data from the projects mentioned above on which to base future water management decisions. However, the committee believes that more real-time integrated climate forecasting, rainfall prediction and water extraction data is needed to provide better decision making tools for those involved in managing the risks posed by climate variability.

**Recommendation 14**

**4.12 The committee recommends that, at its next meeting, COAG come to an agreement about data sharing and the development of protocols relating to climate forecasting, water measurement and water extraction information, and the need to support and resource the development of more accurate monitoring and forecasting systems such as WRON, POAMA and ACCESS.**

***The Water Resources Observation Network (WRON)***

4.13 In evidence to the committee, Dr Bryson Bates made a plea for additional government funding for the Water Resources Observation Network (WRON) project into which CSIRO has already invested $9 million. WRON is modelled on South Korea's Water Resources Operations Centre (WROC) operated by that country's Water Corporation. The Australian network will facilitate the sharing of information on the web about Australian water resources by standardising the data through a Water Resources Mark-up Language (WRML). WRON's developers are also establishing agreements on how data will be shared and how the system will integrate information from electronic and conventional sources.

4.14 The system will integrate new data received through satellite feeds and ground-based sensor networks to provide real-time hydrologic information, using state-of-the art visualisation resources to facilitate decision making about the water resources available. The development of the WRON is supported by an Alliance that includes the Bureau of Meteorology, the Bureau of Rural Sciences, Geoscience Australia, ABARE, the Australian Bureau of Statistics, eWater Cooperative Research Centre, the National Land and Water Resources Audit, the Murray-Darling Basin Commission and Sinclair Knight Merz.

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6 *Submission* 42, Bureau of Meteorology, p.25 quoting C.J.Paull (2002).

4.15 By improving both the water accounting and water reporting systems, WRON, together with climate forecasting tools such as ACCESS, SEACI and projects similar to IOCI will enable water managers, policy makers, water users and those involved in the water markets to make decisions that "incorporate climate variability and change scenarios into understanding the sustainable footprint of irrigation, irrigation demand management, whole farm planning and environmental management" as advocated by CSIRO in its submission.[7] The committee sees a vital need for that type of integrated approach to water management data. CSIRO told the committee that the WRON's national scale approach could result in a saving of 15% to 20% in the annual $2.6 billion costs of water resources management.[8]

4.16 The committee recognises that by taking into account the impact of climate and rainfall variation on water availability, a system such as WRON can help scientists and water managers ensure the longer term security of our water supplies. They can do this by integrating WRON data with the work done by the Bureau of Meteorology, CSIRO and other agencies. The CRC for Catchment Hydrology (CRCCH), for example, has developed techniques for generating long sequences of climate data that may be used to assess the risk of supply failure of our water supply systems. The committee believes that with long-term drought and possible climate change making conditions drier, every possible step should be taken to fast-track the development of WRON so that its potential benefits should be realised more rapidly for farmers and irrigators around the country.

**Recommendation 15**

**4.17 The committee recommends that the government allocate to the CSIRO's Water Resources Observation Network (WRON) project an additional $10 million over three years from the National Climate Change Adaptation Programme.**

## Farming innovation and Adaptation

4.18 Few submissions to the inquiry addressed in any great detail, terms of reference (c) and (e):

- (c) farming innovation *and*
- (e) the implications for agriculture of predicted changes in patterns of precipitation and temperature.

4.19 The Queensland Farmers' Federation (QFF) was one of the few. Its submission stated:

> QFF recognises that responding to and managing for climate variability and change is fundamentally a responsibility of farmers and rural industries. It

7 *Submission* 40, CSIRO, p.9.

8 Dr Bryson Bates, Power Point presentation to the committee, 18 October, 2006, Tabled document.

> is also recognised that this management effort must also be supported by clearly defined government policy and targeted scientific research.[9]

4.20 QFF identified the possibility that changes in seasonal rainfall patterns could deliver rain when it is not needed but also longer periods of drought. With the predicted increases in temperatures, broad acre crops could face heat stress and increased susceptibility to pests and diseases. The submission recognised that climate change might bring both threats and opportunities for rural industries and it called for research into plant varieties and farming practices that might be better suited to climate change. It also called for government funds to be allocated for a research programme to develop adaptation scenarios to climate change for the benefit of farmers. [10]

### *Improved irrigation practices*

4.21 Other submissions to the inquiry dealing with term of reference (c) farming innovation, tended to focus on improved irrigation practices.[11] For example, the manager of Cubbie station compared its very efficient water storage practices to the high evaporation losses of Menindee lakes.[12] Coleambally Irrigation Cooperative Limited referred to its $9 million investment in Total Channel Control technology, a programme aimed at to making water savings by installing improved metering systems and reducing water lost through channel escapes.[13]

4.22 Central Downs Irrigators said in evidence to the committee:

> We have fully enclosed tail water re-circulations, basically representing best practice in furrow irrigation, with overhead systems partly being installed in the area, and drip and various other forms being trialled in the interests of greater efficiency. [14]

4.23 Cotton Australia told the committee that the industry meets the international FAO benchmark of 60 per cent whole farm water use efficiency and that its members are aiming for 75 per cent water efficiency. Cotton farmers do this by using a water budgeting tool called WATERTRACK to:

> …monitor seepage and evaporation losses from farm dams, channels and fields and develop remediation strategies when required.[15]

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9 *Submission* 34, Queensland Farmers' Federation, p.18.

10 *Submission* 34, Queensland Farmers' Federation, p.20.

11 *Submissions* 44, 57 and 63.

12 Mr J. Grabbe, *Committee Hansard,* 2 August 2006, p.29-30.

13 *Submission* 3, Coleambally Irrigation Cooperative Limited, para. 3.1.1.

14 Mr J. Lafrenz, *Committee Hansard,* 2 August 2006, p.46.

15 Cotton Australia Ltd., *Submission* 57, p.6.

***Water losses due to seepage and evaporation***

4.24 In a period when Australia faces increasingly frequent droughts and the prospect of a drier climate, the large amounts of water lost to evaporation has become an issue of concern to irrigators and water policy makers alike. In December 2004, the Pratt Water report, *The Business of Saving Water* sounded the alarm on unaccounted water flows and water losses in the Murrumbidgee river valley. Even if the often quoted figure of 1,333,000 megalitres of water lost is the subject of some dispute, there is no doubt that the losses to evaporation from our rivers, lakes and irrigation channels are huge. The report's research team leader, CSIRO's Dr Shahbaz Khan, pointed that in arriving to an accurate measure of water losses, it was important to distinguish between real water loss to evaporation and seepage into saline groundwater from apparent water loss into good-quality aquifers, or back to the river, where the water is often recovered by water users further downstream.[16]

4.25 For the Murray-Darling Basin, the MDBC's CEO estimated yearly losses as high as 700 GL to 1000 GL before the water reaches South Australia – the equivalent volume of water that the Murray system can expect to get from the Snowy scheme in a year.[17] Referring to another body of water, the Menindee Lakes, Queensland Irrigators and the manager of Cubbie station complained that "on average, 80 per cent of all the water take in Queensland evaporates at the Menindee Lakes".[18] Evaporative losses from the Menindee lakes is often put at an average of 425GL per year, a volume of water equivalent to Melbourne's yearly water consumption. In some years, evaporative losses can go as high as 750 GL.

4.26 At the farm level, the Pratt Water study in the Murrumbidgee Irrigation area suggested the use of 'lay flat' fabric pipes as a cost-effective option for dealing with excessive evaporation of water as it is being delivered to the farm.[19] In a recent major study for grain growers in the Coleambally and Murrumbidgee irrigation areas, CSIRO found that a systems approach could save them more than 300GL of irrigation water with the costs of water saving technologies ranging from $50 per ML to an excessive $5,000 per ML. [20]

4.27 A range of ways of saving water were investigated as part of the study including canal lining, irrigation scheduling, high-tech irrigation technologies, improved cropping patterns and conversion to crops with higher economic returns. In addition, the researchers looked at reducing the break-even period by leasing water for

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16 http://www.cmis.csiro.au/healthycountry/updates/apr05/story2.htm

17 Dr Wendy Craik, *Committee Hansard* , 12 October 2006, p.5.

18 Mr John Grabbe, *Committee Hansard,* 2 August 2006, p.20.

19 DAFF, *Submission* 41, p.38.

20 http://www.csiro.au/csiro/content/standard/ps1jm,,.html

the environment from farmers and providing preferential access rights to saved water for farmers who invested in water-saving technologies.

### *Storage and irrigation infrastructure*

4.28 Evaporation is inevitable in our dry climate but better storage management and better irrigation infrastructure can help reduce the loss of excessive amounts of precious water. The committee welcomes the recent announcement by the Australian and New South Wales governments of joint funding for a feasibility study to establish ways of reducing evaporative losses from the Menindee lakes and securing Broken Hill's water supply. [21]

4.29 In evidence to the inquiry, Engineers Australia expressed concern about the parlous state of Australia's water storage and irrigation infrastructure:

> In the Engineers Australia's Infrastructure Report Card, irrigation assets have been given a C-minus rating, which means 'not fit for purpose'.
>
> Looking at the remaining life of irrigation assets around Australia, …they range from 73 years down to 15 years, so it is a non trivial issue.[22]

4.30 In 2003, the Australian National Committee on Irrigation and Drainage (ANCID) put the annual losses from regional water authorities at around 320 GL. The committee notes that the Department of Agriculture, Fisheries and Forestry indicated in its submission that reducing water loss from water transport and storage infrastructure was a federal government priority as part of the Living Murray Initiative's projects:

> The Australian Government has indicated an interest in investing up to… 40% of the costs of these projects, equating to potentially $71.6 million.[23]

4.31 South Australia has responded to the evaporation problem by building piping systems to replace open channels as a means of carrying water. The water savings more than justify the extra costs involved. An independent assessment of the situation by Professor Peter Cullen found that in South Australia:

> There has been considerable public investment in water delivery systems to farms that sees most water piped rather than transported in open channels".[24]

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21 The Hon. Ian Turnbull, Parliamentary Secretary to the Prime Minister and the Hon. Ian Macdonald, NSW Minister for Natural Resources, Press Releases, 5 Oct 2006.

22 Mr A. Kaspura, Engineers Australia, *Committee Hansard*, 7 March 2006, p.54.

23 DAFF, *Submission* 41, p.17.

24 *Submission* No.52, SA Government, p.14

### *Drought-resistant crops*

4.32 Central Downs Irrigators and Cotton Australia gave evidence to the committee that, in addition to better irrigation practices, the cotton industry has adopted GM technology such as Bollgard cotton which yields more lint per megalitre of water.[25] The committee's view is that the development of new plant varieties is an essential component of the effort to adapt to a drier climate. In that context, the committee notes the work of CSIRO in developing more drought-tolerant grain varieties.[26] In 2003 for example, CSIRO released the wheat variety Rees, developed using innovative gene selection criteria. Rees can produce about five per cent more grain despite receiving the same rainfall. It also has outstanding resistance to major wheat diseases. [27]

4.33 The development of Rees was supported by the Grains Research & Development Corporation (GRDC), the departments of Agriculture in WA, and Queensland as well as Agriculture NSW, AWB Ltd and Enterprise Grains Australia. This cooperative approach illustrates the benefit of partnerships in pursuing innovative ways to adapt to a drying climate. The committee urges government and private agencies involved in agriculture to continue to join forces to fund the search for solutions to the problems that climate change will inevitably bring to the agricultural sector.

4.34 CSIRO is involved in developing other adaptation techniques. Advances in geophysical science are making it possible for CSIRO's Land and Water to develop techniques to "map" the plant-available water storage capacity (PAWC) of farm soil.[28] In addition, CSIRO's ICT centre is developing a system of Wireless Sensor Networks (WSNs) to assist farmers in optimising their water (and other) resources on the farm. According to the Project Leader, Dr Tim Wark,:

> A Wireless Sensor Network comprises a group of "nodes" each measuring a variable, for example soil moisture, which wirelessly interact with their neighbours creating an ad-hoc network which passes information to a central database. By covering a farm with these nodes, the farmer can always have an accurate picture of soil moisture levels to determine the most effective irrigation needs for a field.[29]

4.35 There is no doubt that around Australia, many scientists are involved in developing techniques that will assist farmers and rural industries to adapt to a drier climate. However, all the scientific innovative techniques in the world are useless if

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25 Mr I. Haylor, *Committee Hansard,* 2 August 2006, p.48.

26 CSIRO, Science for Tomorrow, October 2006, http://www.csiro.au/csiro/content/file/pfll,,.html

27 CSIRO Plant Industry, Rees - More crop per drop, www.csiro.au/files/files/p2ik.pdf

28 'Farming Ahead', No. 177, October 2006, p.54, http://www.csiro.au/csiro/content/file/pflt,,.html

29 CSIRO builds smart farm, Press release, 15 September 2006 http://www.csiro.au/csiro/content/standard/ps29v,,.html

they remain a mystery to those who are working the land and who have the means to apply them – the farmers and those engaged in rural industries. The committee sees a need for the Department of Agriculture, Fisheries and Forestry (DAFF) to develop an integrated database of information about farming innovations currently being developed to assist farmers cope with drier climate conditions. The committee believes also that DAFF should undertake a communications programme aimed at making farmers and all those involved in rural industries aware of new research and new sources of online information about adapting to climate change.

### *Rural and urban water trading*

4.36 A number of utilities, individuals and organisations around the country are addressing the need to save water by exploring new avenues. The following two examples from opposite ends of the Australian continent, south east Queensland and Western Australia were brought to the attention of the committee during its inquiry.

4.37 One of the ways in which the WA Water Corporation has responded to the serious drop in rainfall and run-off in the south-west of the state is by buying water from a group of rural irrigators at Harvey, south of Perth to supplement urban demand. The arrangement includes payment in kind through replacing open irrigation channels with a pipe network that makes water delivery to the farmers more effective by eliminating loss to evaporation.

4.38 The committee is firmly of the view that such examples of urban-rural cooperation on water initiatives can be of great benefit to those who engage in it and it would like to urge water authorities around the country to look for opportunities to develop similar approaches.

4.39 In other innovative (at least in the Australian context) approaches to ensuring a reliable water supply for Perth in a drying climate, WA Water Corporation has constructed a large desalination plant at Kwinana, about 40 kilometres from the city, which is now supplying 17 per cent of Perth's water needs. It is also exploring other, if somewhat controversial possibilities, including extracting water from the south-west Yarragadee ─ a big aquifer about 300 kilometres south of Perth.

## Water Recycling in Toowoomba

4.40 The committee held a public hearing in Toowoomba, a city that has experienced water restrictions since 1992 and the only Australian city to have considered a serious direct potable reuse proposal, that is, a plan to recycle waste water to supply one quarter of its water needs including all domestic uses and drinking water. The reason Toowoomba considered this plan is that the city currently has just enough water for two years consumption and according to Toowoomba's mayor:

> There is both depleting rainfall and depleting run-off. We get a bit of rain and it fills the catchment, but before we get the next bit of rain it has dried out and we have to go again, so our catchment never stays wetted up enough for us to get run-off. We have seen a fairly substantial lack of run-off over the last 30 years. I should tell you that our major dam in the last 15 years has run over on only 16 consecutive days on one occasion. In the two previous years, it ran over on 285 days.[30]

4.41 The committee's visit took place on 2 August 2006, just 4 days after the people of Toowoomba had rejected the recycling proposal in a plebiscite by a vote of 68 per cent to 32 per cent. Concern was expressed in the hearings that the period for consultation was too short to allow an effective public education campaign, and that an alternative solution to secure the city's water supply was not put forward. The direct potable reuse campaign had been conducted intensely for three months prior to the referendum and the idea had first been talked about less than 10 months before the vote. Toowoomba's mayor told the committee that, in her opinion, three or four years were needed to educate the public about the scientific aspects of the issue under consideration. The plebiscite decision effectively leaves the city still searching for a solution to an increasingly pressing problem. The irony is that legitimate public concerns about the health and safety of their water ultimately led the citizens of Toowoomba to reject a water source which is arguably cleaner than their current supply.

4.42 Direct potable reuse is only one of a range of approaches to water recycling, and systems based on the substitution of recycled water for industrial, agricultural and other non-potable uses (such as watering parks and gardens) are more likely to receive public endorsement in the shorter term. The Chair and Chief Executive Officer of the National Water Commission, Mr Ken Matthews, sees water recycling as one of key policy areas that have to be addressed by the National Water Initiative. He told the committee:

> there is a need for more widespread and objective consideration (of water recycling) across Australia. Surely Australia, as the driest inhabited continent in the world, should be an early adopter of new and cost-effective recycling technologies that are now becoming available.[31]

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30 Councillor Di Thorley, *Committee Hansard,* 2 August 2006, p.9.

31 Mr Ken Matthews, *Committee Hansard,* 7 March 2006, p.3.

4.43 It appears that in the first instance, using recycled water for watering parks and gardens and for industrial purposes will prove more acceptable to the public than using it for domestic purposes.[32] Twin-pipe or 'purple pipe' domestic systems, which use recycled water for non-potable domestic purposes (like flushing toilets or watering gardens) are another less-controversial option for new developments, but the cost of retro-fitting such systems to existing suburbs is prohibitive. Western Australia's Water Corporation is currently involved in a joint project with CSIRO to research the possibilities of managed aquifer recharge, in which recycled water is infiltrated into an aquifer. The method increases water storage in the aquifer, to make more water available for irrigation and other uses and also to preserve water levels in wetlands that are maintained by groundwater. The intention is to use the aquifer's water initially for watering parks, ovals and golf courses.[33]

4.44 Ideally, recycled urban wastewater should not only be available for use in cities and for industry but, where possible, it should add to the volume of water available for irrigation in rural areas. This is happening to some extent already, for example in South Australia as explained by the South Australian government in its submission to the committee:

> Trials involving the storage and recovery of treated wastewater for irrigation of horticultural crops are currently being undertaken at Bolivar on the Northern Adelaide Plains and in the McLaren Vale area.[34]

4.45 Elsewhere in the country treated town water is routinely returned to various rivers and streams but a concerted effort should be made to make this the norm rather than the exception. More importantly, town and shire councils should not be reluctant to reveal this to ratepayers since it would assist in making the concept of using recycled water more acceptable, and would constitute an important step in encouraging judicious use of a precious resource that is becoming scarcer in many areas through reduced rainfall at the same time as a growing population means that demand for it is growing.

4.46 Toowoomba's mayor, Councillor Thorley, argued that seeing an advanced water recycling plant in operation would help people make a decision based on facts rather than emotion.[35] In the committee's view, there is a case for governments to invest in one or more water recycling plants around the country as part of a community education project designed to raise the awareness of the Australian public in regards to how a water recycling plant would work and how safe the water would be.

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32 Note: The committee is only too aware that this does not solve the water shortage problems of cities like Toowoomba and Goulburn.

33 http://www.watercorporation.com.au/M/mar.cfm?uid=4994-1407-5238-5959

34 *Submission* No.52, SA Government, p.29.

35 Councillor Di Thorley, *Committee Hansard,* 2 August 2006, p.14

4.47 The reason why this would make sense is that, while the issue has been decided in Toowoomba, it is highly likely that at some future date, other cities and regions may wish to consider putting recycled water to uses that have not been contemplated previously in this country. Politicians of all persuasions are on the public record as backing this idea.[36]

**Recommendation 16**

**4.48 The committee recommends that the federal government should commit to the construction of one or more advanced water recycling plants to produce water for a range of both potable and non-potable uses in order to raise public awareness about the safety of recycled water.**

## Conclusion

4.49 Managing our water resources is a difficult balancing act. We are a growing nation living on a dry continent with extremely variable rainfall patterns, and recent years have brought water supply security problems to our agricultural industries, major rural centres and a number of our cities. The challenge for policy makers is how to best balance competing demands for a limited precious resource in a manner that ensures the sustainability of the resource, equity among competing users, predictability and security of supply for our industries and populations, and still guarantees the survival of treasured environmental assets. The issue is made more difficult by the complexity and uncertainty of the science of assessing the resource, and predicting the impacts of drought and increased climate variability. Ultimately we need to be able to make good decisions on the basis of the available information knowing that we cannot predict the future. We need flexible and adaptable water management systems that can deliver equity and certainty to all users. At stake is the viability of our cities and towns, our industries and our ecosystems, our very way of life.

4.50 Although there are gaps in the information available on all aspects of climate forecasting, a number of promising initiatives are underway to gather more accurate climate data and develop better forecasting methods. While uncertainties in climate science are being reduced, it is still important to recognise that we are dealing with probabilities and risks when talking about climate forecasts. New drought and rainfall forecasting tools and scientifically-based suggestions for adaptation will only be of full benefit to those working on the land if they are made aware of the usefulness of new research through effective communications programs. Funds must be made available for education programs for rural industry groups right around the country. Only by tailoring the message to the needs of the end users can that message be communicated effectively. For this to happen, those who undertake such education programs must be adequately trained for the job.

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36 Kim Beazley, *Media statement*, 5 April 06, John Howard, *SMH*, 17 July 06, Andrew Bartlett, *The Bartlett Diaries*, 28 July 06, Rachel Siewert, *Aust Greens Online*, 15 August 06, Andrew Stoner, *Press Release,* NSW Nationals, 26 August 06.

4.51 The evidence gathered during the course of this inquiry has convinced the committee that Australian scientists and researchers have the creative capability to find ways to adapt to climate change and use the country's water resources most efficiently. In addition to its $30.7 million investment into the research effort as part of the Australian Climate Change Science Programme, the Australian government has made $14 million over four years to the National Climate Change Adaptation Programme. Those funds should be used to pursue every avenue of research that will enable all Australians, in rural as well as in urban areas, to adapt in the face of the challenge posed by climate change.

Senator Bill Heffernan
**Chair**

# Labor Senators Additional Comments

1.1 Labor Senators share the concerns of the Committee about the ongoing impacts of water over-allocations and unlicenced extractions from our river systems, believing that these are unsustainable and must be addressed urgently.

1.2 The collective emphasis of climate science has now shifted the argument from the reality of climate change to assessment of the seriousness of its impacts. Several studies indicate that Australia will become hotter and drier in coming decades with more extremely hot days and fewer cold days. Global warming will result in a significant reduction in rainfall and riverflows and higher evaporation of the water in reservoirs.

1.3 Labor calls for greater recognition of the importance of both adaptive and mitigative strategies to deal with the broader impacts of climate change on our national water supplies.

1.4 Labor members believe that the Howard government has wasted ten long years denying the existence of climate change and much more must be done to make up for this decade long lack of action. Significantly more must be invested in addressing the cause of climate change and assisting farmers, industry and the public to adapt to much drier conditions.

1.5 Throughout the inquiry, the Committee heard from a range of witness about the consequences of the failure of the Howard Government to deliver on key commitments under the Living Murray Initiative. The recent National Water Summit, called in haste, achieved little other than to identify limitations of the National Water Initiative to deliver key outcomes, particularly those in relation to the Murray Darling system.

1.6 Labor Senators urge the Government to move more quickly on the funding of infrastructure projects under the National Water Initiative and to re-visit issues and priorities around national standards and licensing regimes, particularly for floodplain harvesting.

1.7 The Wentworth Group of Concerned Scientists have stated that nature has overtaken the timeframes of the National Water Initiative and that it must be revisited to strengthen outcomes that are in the national interest. The National Water Initiative has as its centrepiece the establishment of a national water market, and while market mechanisms will deliver more appropriate water pricing and demand from high end value users, in record drought conditions it is not possible to trade water between systems if it not there. Therefore it is important that other policy instruments are developed to address the water priorities.

Senator Ursula Stephens

Senator Kerry O'Brien

Senator Anne McEwen

Senator Glenn Sterle

# Additional Comments from the Australian Greens

## Water Policy Initiatives

Understanding the likely impacts of reduced rainfall, increased temperatures and increased climactic variability and the need to undertake appropriate forward planning and developing appropriate adaptation strategies are critical issues for water resource security in Australia. The Australian Greens believe that these issues are not being dealt with the degree of urgency or at the level of detail required. We are extremely concerned that the consensus among our scientific experts in the areas of water resources, climate and agriculture is that predicted climactic changes and those already thought to have taken place pose a major threat to the security of our water resources and the ongoing viability of some of our agricultural zones.

Significant evidence was presented to the committee inquiry on this issue that demonstrated that there is a pressing need to act decisively on these issues.

**Need to factor climate change into water management**

Under these circumstances we urgently need to re-evaluate our water resource security planning, look at our priorities for water use and the way we allocate risk, and to take very seriously the issue of developing adaptation strategies based on the best science.

The Australian Greens believe that we need to consider the flexibility and adaptability of our allocation systems to deal with the likely impacts of climate change.

The fundamental importance of factoring the impacts of climate change into our systems of water management and allocation was put very clearly by CSIRO in their submission to the inquiry, where they stated that:

> ... *"Under the present water reforms, longer term water security is not guaranteed since these reforms do not explicitly take into account threats to water quantity and quality due to enhanced climate variability and change."*

CSIRO suggests that there are significant knowledge gaps in terms of the impacts of climate change on irrigation, water management, regional planning and the economy suggesting that *"it is crucial to understand the impact climate change would have on water demand and potential land use changes as water is traded to higher value production."*

This implies that we should undertake this analysis on the likely (social, economic and environmental) impacts of current water reforms as a matter of priority.

CSIRO then suggested that: *"a multi-stakeholder national initiative is needed to consider climate change impacts on farm to regional levels, and to devise robust policy options for the viability of irrigated agriculture, hydroelectric power generation, rural industries and regional communities."*

And then went on to recommend:

*"There is a need to incorporate climate variability and change scenarios into understanding the sustainable footprint of irrigation, irrigation demand management, whole farm planning and environmental management."*

The Queensland Farmers Federation also stated:

*QFF recognises that responding to and managing for climate variability and change is fundamentally a responsibility of farmers and rural industries. It is also recognised that this management effort must also be supported by clearly defined government policy and targeted scientific research.*

*...*

*QFF does not believe that current drought programs adequately address the needs of intensive agricultural industries, continuous production systems, and those impacted beyond the farm gate.*

*Recommendations for policy change include:*

- *A national approach to drought preparedness and drought management is a preferred position to the present reactive and uneven approaches embedded in the 'Exceptional Circumstance' programs.*
- *Farm management system programs which incorporate climate variability offer considerable leverage in dealing with future droughts and climate change/variability, and therefore should become the linchpins of future 'drought policies'.*
- *There is a need to prepare ahead for drought so the impacts can be minimised.*

*QFF suggests that a national approach to drought preparedness and drought management is a preferred position to the present reactive and uneven approaches embedded in the 'Exceptional Circumstance' programs.*

*[QFF submission 34, page 5]*

***Climate change must be given greater attention in water resource management and decision making.***

**The impact of recent water policy initiatives**

The terms of reference of the inquiry directed that the committee look specifically at the impact on rural water usage of recent policy initiatives and the possible role of Commonwealth agencies.

To an extent, the ability of the committee to assess the impact of recent national policy initiatives has been limited by the extent to which the current major initiative NWI (the National Water Initiative) appears to be in and early stage of implementation. However, given that the NWI was signed by most of its parties of 25th June 2004 and built on a previous COAG framework that had been in place for a decade, the lack of progress on the initiative and the difficulty faced in identifying and assessing its major impacts is itself a cause for major concern. The Australian Greens are concerned that given the increased risk to water security currently facing Australia that the committee report has not gone far enough in assessing and commenting upon the impacts of this policy, nor does it provide sufficient discussion and recommendations as to how these

issues could be addressed, particularly in relation to the potential role that could be played by Commonwealth agencies.

Water policy is constitutionally a state responsibility, and the delays in the implementation of key aspects of the NWI - such as the adoption of standardised terminology, a consistent approach to water entitlements, the sharing of monitoring data, and facilitation of cross-border water trading - can predominantly be laid at the feet of recalcitrant state bureaucracies. However, at the same time it must be noted that there has been an absence of leadership at the federal level, and that the Commonwealth has not been above politicising water issues.

The committee heard evidence of this in Toowoomba, where the decision to impose a referendum on direct potable reuse, that failed to present an alternative water supply options and did not allow time for community education, has left the town without an easy answer to its water crisis. The ultimate consequence of the politicisation of this referendum is a significant setback for public acceptance of water recycling schemes at a time when water resource experts are saying that recycling will of necessity play a central role in solving our nation's water security problems. It is important that the Commonwealth makes the most of the opportunity to show leadership through NWI, and more thought should be given to how the Commonwealth can play a constructive role in getting NWI back on track. The Commonwealth could, for instance, more closely link delivery of its funds (from the $2 Billion Australian Government Water Fund) to the achievement of NWI commitments. The decision to move away from outcomes-based funding under NWI has proved to be a retrograde step.

**Adaptation Strategies & Farming Innovation**

The issue of the adaptation of Australian agriculture to reduced rainfall, higher temperatures and increased climactic variability is particularly important to the future of regional Australia. The Australian Greens are concerned that seriousness of the implications of climate change for the future of our rural communities and exports, our waterways and our environment are not being sufficiently canvassed.

We believe that there is a pressing need for research and development into adaptation strategies, and believe there needs to be wider discussion of the options beyond the GM cotton, drought resistant wheat varieties and improved irrigation practices mentioned in the committee report.

Improvements to the water use efficiency of irrigation systems and the resilience of current crops are only one aspect of farming innovation. While these incremental improvements are an important part of water resource management, and there are opportunities to recover significant volumes of water lost by current irrigation practices in many areas through leakage and evaporation, they are unlikely to recover sufficient volumes of water alone. The extent to which the system is already over-allocated combined with the predicted impacts of climate change on water availability make it likely that these initiatives alone will not be sufficient to ensure the ongoing sustainability of our rural industries and populations.

This is where farming innovation and agricultural research and development aimed at adaptation strategies is likely to be of crucial importance. The Australian Greens believe that we need to give greater consideration to increasing the sustainability, the flexibility and the resilience of our agricultural production systems and that we need to be providing better risk management tools to our land managers.

In their submission to the Inquiry, ACF suggested that:

> "*… there is an urgent need for a national policy framework that drives large-scale private investment in a wide variety of commercial-environmental ventures … It should serve to build the capacity of private land and water managers and investors to explore and identify new commercial opportunities that demonstrate multiple environmental benefits*." (ACF submission 15 page 9)

These comments refer to the findings of the 2001 Allen Consulting Group report to the Business Leaders Roundtable commissioned by CSIRO Land & Water, a group of private companies and ACF, which found that there were productive opportunities for industry-government partnerships that could deliver benefits to both land holders and the environment provided government provided the right kind of policy incentives.

The Australian Greens believe that more consideration needs to be given both to the kind of incentive schemes adopted and the extent to which incentives are linked to specific outcomes in particular target landscapes. We are concerned that there is a need for the incentive schemes to avoid the kinds of problems that have emerged from the experience of MIS (Managed Investment Scheme).

The Australian Greens also believe that more thought needs to be given to the sustainability and viability of alternative crops and systems advocated, and that ultimately this needs to be part of a renewed national effort to assess and plan for the likely impacts of climate change on our agricultural zones. Such an assessment could then provide the basis for an extended research and development program targeted to address known gaps, and the development of incentives and support packages for landholders in areas of identified need. Such targeting would address the concerns raised by QFF in relation to the *"reactive and uneven approaches"* embedded in the 'Exceptional Circumstances' programs.

While The Australian Greens support calls for improving irrigation efficiency and believe that governments can play an important role in doing so, we believe that public investment in improving irrigation infrastructure should be provided under circumstances where this action results in an appropriate level of public benefit in return - for example, through water savings being returned to public uses (town supplies, environmental flows). The public benefits ultimately need to balance the costs for this not to simply be an undue form of industry subsidy - they should be justifiable and comparable to the costs of securing water by other means. This view is supported by the ACF submission, which states:

> *"There are clear opportunities for partnerships between business and government jointly investing in efficiency projects and using public money to leverage private investment in adopting farm-based innovation. All investment of public money*

*should result in commensurate public benefit, and water recovered as a result of public investment must be returned to the environment rather than the consumptive pool." (ACF submission 15 page 9)*

The Australian Greens believe that it is reasonable for the community to expect that there is a level of obligation on all Australian industries, including irrigation, to contribute to making their industries more sustainable.

**Conclusion**

The Australian Greens believe that a greater sense of urgency is required to address the water crisis facing Australia. The system is unlikely to ever return to 'business as usual,' particularly in the Murray Darling Basin, and so it is essential that State and Federal governments move more quickly to address the problem of over-allocation, address climate change and take action to save our waterways, floodplains and wetlands before it is too late.

Senator Rachel Siewert
Australian Greens

# Appendix One

## List of Submissions

**1.** Hindmarsh Shire

**2.** Dr Mark Patrick Taylor, Macquarie University, Sydney

**3.** Coleambally Irrigation Cooperative Limited

**4.** Concerned Lower Lachlan Community

**5.** Australian Floodplain Association

**6.** Quambone Pastoral Company

**7.** Pioneer Valley Water Board

**8.** Engineers Australia

**9.** Professor Richard Kingsford, School of Biological, Earth and Environmental Sciences

**10.** Mr Robert and Ms Ann Senior

**11.** Messrs Tony and Derek Schneider

**12.** Australian Bureau of Agricultural and Resource Economics (ABARE)

**13.** Mr Robin Gaskell

**14.** Water for Australia

**15.** WWF-Australia

**16.** Mr Owen and Ms Karen Betts

**17.** Paroo River Association Inc

**18.** Mr Max Sandford

**19.** Mr Rick and Ms Helen Hall

**20.** Mr Edward Fessey

**21.** Mr Andy Sullivan

**22.** North Burdekin Water Board and South Burdekin Water Board

**23.** The Western Australian Farmers' Federation (WAFarmers)

**24.** Mr Richard and Ms Catherine Bucknell

**25.** Ms Janet Stein

**26.** Mr James Clive Green and Ms Victoria Campbell Green

**27.** Mr Jon Nevill, OnlyOnePlanet Consulting

**28.** Mr David Hanlon and Ms Amanda Friend

**29.** Mr Bill and Ms Willa Hagarty

**30.** (Affected landholders) Birrie River and Floodplain

**31.** Mr Christopher Irons

**32.** Lower Balonne Floodplain Association

**33.** Messrs Peter and Pop Petersen

**34.** Queensland Farmers' Federation

**35.** Murray-Darling Basin Commission

**36.** Australian Spatial Information Business Association

**37.** Australian Property Institute

**38.** Australian Conservation Foundation and Inland Rivers Network

**39.** National Water Commission

**40.** CSIRO

**41.** Department of Agriculture, Fisheries and Forestry

**42.** Australian Government Bureau of Meteorology

**43.** Mr Ian Marshall

**44.** Ricegrowers' Association of Australia Inc.

**45.** NSW Irrigators' Council

**46.** Murrumbidgee Irrigation

**47.** Smartrivers

**48.** Tasmanian Government

**49.** Environment Centre NT Inc.

**50.** Mr Laurence Jones

**50A.** Mr Laurence Jones

**51.** Ms Catherine Davis

**52.** South Australian Government

**53.** Huon Valley Council

**54.** Ms Wendy Bunce

**55.** Cubbie Group Ltd

**56.** Chinchilla and District Water Users' Association

**57.** Cotton Australia Ltd

**58.** CONFIDENTIAL

**59.** Mrs Terry Murphy-Fleming and Phillip Fleming
Mr Howard Blackburn

**60.** Murray Lower Darling Rivers Indigenous Nations

**61.** Water Services Association of Australia

**62.** T Bowring & Associates P/L

**63.** Central Downs Irrigators Limited

**64.** Macquarie River Food & Fibre

**65.** Peter M Gately & Associates

# Appendix Two

## Witnesses who appeared before the Committee at Public Hearings

***Tuesday, 7 March 2006***
***Parliament House, Canberra***

**National Water Commission**
Mr Ken Matthews, Chair and Chief Executive Officer
Mr Malcolm Thompson, General Manager, Water Reform Group
Dr Colin Chartres, Science Advisor

**Murray Darling Basin Commission**
Mr Robert Douglas, Director, Water Policy Coordination
Mr Scott Keyworth, Director, Strategy Implementation
Mr Leslie Roberts, General Manager, Natural Resources
Mr Andrew Close, Manager, Water Resources Group

**Commonwealth Scientific and Industrial Research Organisation**
Mr Warwick McDonald, Acting Flagship Director, Water for a Healthy Country
Professor Michael Young, Chief Research Scientist, Land and Water and Adjunct Professor, University of New England and Charles Sturt University

**Engineers Australia**
Mr Andre Kaspura, Policy Analyst
Mr Alexander Loy, Chair, National Subcommittee on Water Data
Dr Ian Cordery, Committee Member
Dr William Weeks, Committee Member

**Australian Property Institute, Australian Spatial Information Business Association and Open Geospatial Consortium Australasia**
Mr John Sheehan, Chair, Government Liaison, and Past NSW Divisional President Australian Property Institute
Mr Jeffrey Warner, Deputy National Director, Australian Property Institute
Mr David Hocking, Chief Executive Officer, Australian Spatial Information Business Association
Dr Robert Starling, Regional Coordinator, Open Geospatial Consortium Australasia

**Australian Bureau of Agricultural and Resource Economics (ABARE)**
Dr Stephen Beare, Chief Economist
Ms Annalise Heaney, Manager, Land and Water, Natural Resources Branch

**Department of Agriculture, Fisheries and Forestry**
Mr Tom Aldred, Executive Manager, Natural Resource Management Division

Mr Ross Dalton, General Manager, Assessment, Innovation and Climate Change
Dr Colin Grant, Deputy Executive Director, Bureau of Rural Sciences
Mr Simon Smalley, General Manager, Water Policy and Murray-Darling Basin

***Wednesday, 2 August 2006***
***Toowoomba City Hall, Toowoomba***

**Toowoomba City Council**
Councillor Dianne Thorley, Mayor
Councillor Lyle Shelton

**Cubbie Group Ltd**
Mr John Grabbe, Joint Managing Director, Cubbie Group Ltd
Mr Paul Brimblecombe, Joint Managing Director, Cubbie Group Ltd
Councillor Robert Buchan, Mayor, Balonne Shire Council

**Central Downs Irrigators Ltd/Queensland Irrigators' Council**
Mr Ian Hayllor, Vice Chairman, Central Downs Irrigators Ltd
Mr Jan Lafrenz, Chairman, Central Downs Irrigators Ltd
Mr Franklyn Brazil, Chairman, Queensland Irrigators' Council

**Toowoomba and Region Environment Council**
Ms Sarah Moles, Member

**Condamine Alliance**
Mr Richard Browne, Chair
Mr Phillip McCullough, Chief Executive Officer

**Queensland Farmers' Federation**
Mr Gary Sansom, President
Mr Ian Johnson, Water Adviser

***Wednesday, 16 August 2006***
***Parliament House, Canberra***

**New South Wales Farmers Association, Brewarrina Branch/Lower Balonne Floodplain Graziers Association**
Mr Edward Fessey, Chair, NSW Farmers' Association, Brewarrina Branch and Member, Lower Balonne Floodplain Graziers' Association
Mr Rory Treweeke, Chairman, Lower Balonne Floodplain Graziers' Association

**Water Corporation of Western Australia**
Dr James Gill, Chief Executive Officer

***Friday, 15 September 2006***
***Parliament House, Canberra***

**WWF-Australia**
Dr Stuart Blanch, Northern Landscapes Manager, Freshwater Manager

**National Water Commission**
Mr Malcolm Thompson, General Manager, Water Reform Group
Mr Harry Abrahams, Team Leader, Water Access Entitlements and Planning
Mr Matthew Kendall, Project Director, Australian Water Resources Assessment
Mr Steven Costello, General Manager, Water Programmes Group

**Cotton Australia**
Mr Ralph Leutton, Program Manager

**New South Wales Irrigators Council**
Mr Doug Miell, Chief Executive

**Mr Robert Caldwell, Forbes farmer**
**Mr Peter MacPhillamy, Forbes farmer**

**Murray Lower Darling Rivers Indigenous Nations (MLDRIN)**
Mr Steven Ross, Coordinator

**Australian Conservation Foundation and Inland Rivers Network**
Dr Arlene Buchan, Healthy Rivers Campaigner
Ms Amy Hankinson, Coordinator

***Thursday, 12 October 2006***
***Parliament House Canberra***

**Murray Darling Basin Commission**
Dr Wendy Craik, Chief Executive
Mr Robert Douglas, Director, Water Policy Coordination

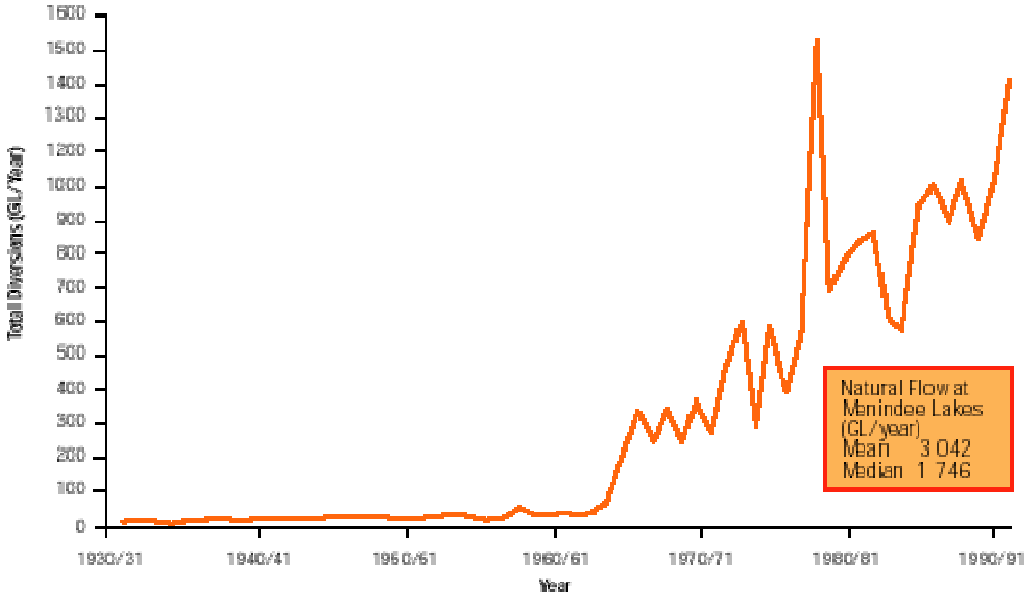
***Wednesday, 18 October 2006***
***Parliament House, Canberra***

**Commonwealth Scientific and Industrial Research Organisation (CSIRO)**
Dr Bryson Bates, Director, Climate Program
Ms Donna Edman, General Manager, Government Relations

**University of New South Wales**
Professor Richard Kingsford, Professor of Environmental Science, School of Biological Earth and Environmental Sciences

# Appendix Three

## Annual diversions from the Darling River, 1930-31 to 1990-91 (source Thomson 1994)




MDBC, The Impacts of Water Regulation and Storage on the Basin's Rivers,

http://www.mdbc.gov.au/nrm/water_issues/impact_of_water_regulation_and_storage