THE AUSTRALIAN COLLABORATION

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Rural Water

Water management is one of Australia's most significant natural resource management issues. From the late nineteenth century to the 1960s, water resources were exploited as part of a general policy of nation building: first, in response to drought to ensure adequate water supply often through dam building; and second, to develop irrigated agricultural industries as a key contributor to economic development and export earnings. Today, one of the greatest challenges in the management of Australia's water resources is to find an appropriate balance between economic development and ecosystem health.

The Australian continent is characterised by extremes of floods and droughts. Fresh water is a scarce resource due to its uneven distribution in time and space. Increasing stress is being placed on the resource because of factors such as growing demand from irrigators, population growth and human induced climate change. Of the inhabited continents, Australia is the driest and has the lowest percentage of rainfall as run-off, the lowest volume of water in rivers, and the smallest area of permanent wetlands. On average only 12 per cent of rainfall is collected in Australian rivers. Despite these relatively scarce water resources, at 20 megalitres (ML) per person Australia has one of the highest per capita average annual discharges (water available from groundwater and surface water recharge) in the world due to its population size relative to land mass. In comparison, most Middle Eastern, African and Mediterranean countries have approximately 1 ML per capita discharge.

Water resource management

Australia's water resources are divided into management areas. Australia has twelve major drainage divisions and these are broken up into river basins and further divided into surface water management areas. Likewise, groundwater provinces are further divided into management units (Table 1). Surface water is defined as water in streams, rivers, lakes and wetlands, while groundwater is water beneath the surface of the ground, especially from aquifers. Of these management areas 26 per cent of surface and 34 per cent of groundwater management units have been assessed as being overdeveloped. The amount of groundwater that can be sustainably extracted each year is estimated to be 25,780 gigalitres, of which 2489 gigalitres is used. The Great Artesian Basin is one of the world's largest aquifer systems and is estimated to store 8,700,000 gigalitres, of which approximately 570 gigalitres are extracted per year. While the Great Artesian Basin has a vast quantity of water, much of its quality is low.

Table 1: Australian water management areas

Management Unit	Total
Surface water	
Drainage divisions	12
River basins	246
Surface water management areas	325
Groundwater	
Groundwater provinces	69
Groundwater management units	538

The data presented in Table 2 conveys a number of key features of Australia's water resources. First, is the difference between rainfall and runoff; only a small proportion of rainfall enters our waterways. Second, is the variability in runoff between years, 2004-05 had roughly two thirds the estimated runoff of 2000-01. Third, is a paucity of data, for instance the Australian Water Account published in 2000 was the first attempt to produce an Australian wide environmental water account. Much of the data presented here are taken from estimates from a range of organisations appointed to manage water resources. This deficiency of quality historical data on Australian water resources presents difficulties for planning and decision making. Table 2 also shows that large volumes of water are extracted from the environment, yet not all of this is

Table 2: Total Australian water supply and consumption for years 1996-97, 2000-01, and 2004-05 in gigalitres (GL).

Water source/use	2004-05	2000-01	1996-97
	GL	GL	GL
Rainfall	2,789,424	Not available	Not available
Evapotranspiration	2,497,471	Not available	Not available
Runoff	242,779	385,924	Not available
Extracted	79,784	76,668	68,703
Consumed	18,765	21,703	22,185
• Agriculture	12,191	14,989	15,503
• Forestry and fishing	51	44	19
• Mining	413	321	570
• Manufacturing	589	549	728
• Electricity and gas	271	255	1,308
• Water supply	2,083	2,165	1,707
• Other industries	1,059	1,102	523
• Households	2,108	2,278	1,829

(Sources: Australian Bureau of Statistics, Water Account Australia 2004-05; Water Account for Australia 1993-94 to 1996-97).

Table 3: Total agricultural water consumption in gigalitres (GL), by sector

Agricultural sector	2004-05	2000-01	1996-97
	GL	GL	GL
Dairy farming	2,276	2,593	na
Vegetables	455	507	635
Sugar	1,269	1,234	1,236
Fruit	648	645	704
Grapes	717	656	649
Cotton	1,822	2,896	1,841
Rice	631	2,223	1,643
Livestock, pasture, grains and other			
• Livestock	1,035	Not available	na
• Pasture (not including dairy farming)	1,928	na	na
• Grains	1,162	na	na
• Other	249	na	na
• Total	4,374	4,235	8,795 (includes dairy)
Total	**12,191**	**14,989**	**15,503**

(Sources: Australian Bureau of Statistics, Water Account Australia 2004-05, Water Account for Australia 1993-94 to 1996-97)

consumed. The majority of extracted water is used in hydro-electric power generation and is released into streams as regulated discharge. Of the consumed water the majority of this is utilised in agriculture. Agricultural water use by sector is presented in Table 3. The units of measurement used in this fact sheet to describe volumes of water are megalitres and gigalitres. One megalitre is equivalent to one million litres, while one gigalitre is the equivalent of one billion litres of water.

Table 3 presents a breakdown of water use by the agricultural sector for 2004-05, 2000-01, and 1996-97. Livestock industries, and in particular dairy farming, are major consumers of Australian water. The consumption of water by the cotton and rice sectors is responsive to supply, in times of high supply they use large volumes, but water use diminishes in periods of low supply.

Australia's water policy

In 1994 the Council of Australian Governments (COAG) agreed that reform of water management was a matter of national and state significance and a number of measures were introduced to initiate the reform process. To reactivate this reform agenda, COAG in 2004 agreed to the National Water Initiative. The Initiative is a comprehensive strategy for water reform in Australia. It was described by the late Professor Peter Cullen, one of Australia's leading water experts, as "world class management of water". The Initiative is a response from all levels of Australian government to deal with widespread natural resource degradation whilst increasing the productivity and efficiency of water use. It is widely supported by major water and river health stakeholders.

In 2004 a National Water Commission was appointed to have the responsibility to steer national water reform. Two billion dollars was committed over five years by the Federal Government to the Australian Government Water Fund to achieve the goals of the Initiative. Through the Initiative, governments are: encouraging the development of water markets; collecting more information regarding water resources; encouraging better planning; putting greater emphasis on urban water issues, and making over-allocated systems a management priority.

At the end of 2006, a National Water Summit was held to discuss how to deal with the drought and the over-extraction of water from Australian rivers. An outcome of the Summit was that emergency work should be undertaken to protect urban water supplies and that a working group should be established to secure supplies by 2007-08. In January 2007, former Prime Minister John Howard announced the National Plan for Water Security ("the Plan"). The Plan was designed to bring about more sustainable management and use of the nation's fresh water resources. A key element of the Plan was that the power to manage the water resources of the Murray-Darling Basin should be shifted from the Basin States to the Commonwealth. Commonwealth funding of $10 billion was put forward to achieve the goals of the Plan, with a significant proportion of this money aimed at the Basin and irrigated agriculture. The Plan gave the Commonwealth powers to: set a Basin-wide cap on surface and groundwater use; establish Basin-wide water quality objectives; set standards for catchment level plans; impose seasonal allocations of water; direct rural bulk water supply systems; facilitate environmental water management; and set rules for water trading regimes. The plan included $6 billion for overhauling outdated irrigation systems and $3 billion to address the over-allocation of water in the Murray-Darling Basin. Negotiations continued for over a year due to Victorian Government concerns about the allocation of water to irrigators in the state. In March 2008, Prime Minister Kevin Rudd announced that the Basin States had agreed to establish a new basin-wide plan and the introduction of a new act. The Act and the Basin Plan, which are based on the reforms contained in the National Water Initiative, are generally consistent with the proposals put forward in the original plan. However, the States ceded less power than was originally proposed. Key responsibilities falling under the jurisdiction of the Commonwealth will be to carry out Basin-wide water planning, in particular to determine water pricing, manage an environmental entitlement and manage information on water availability and use. The Plan has been renamed Water for the Future (WFTF) by the current government, with investment increasing to $12.9 billion and priorities areas being redefined. The four priority areas of WFTF are: Taking Action on Climate Change; Using Water Wisely; Securing Water Supplies; and Supporting Healthy Rivers.

Enormous challenges lie ahead as the nation seeks to achieve the sustainable management of its water. Complex issues such as historical precedents, multiple stakeholder interests, declining ecosystem health, and the

Table 4: Average annual water balance for Murray-Darling Basin rivers (2005)

	Natural Conditions (GL/annum)	Current Conditions (GL/annum)
Runoff	23,850	23,850
Inter-basin transfers	0	1,200
Diverted	0	11,580
Evaporated from reservoirs	0	1,430
Consumed by wetlands, floodplains etc	10,960	5,970
Outflow to sea	12,890	5,070
Outflow to sea as a % of runoff	54%	21%

Source: **http://www.mdbc.gov.au/subs/eResource_book/chapter1/p2.htm**

problems inherent in achieving a fair system of entitlements between all stakeholders will be extremely difficult to resolve. Uncertainty due to a lack of detailed data on water availability and the daunting prospects of climate change compound these challenges. As Kenneth Davidson in The Age has pointed out, an example of the dilemmas facing planners is the question of water allocations from the Murray-Darling Basin. On the one hand, Lake Alexandrina at the mouth of the Murray is drying out, exposing sulphides that turn into sulphuric acid when exposed to the air; the lake is already toxic to animals. The threat is that salts and sulphur will move upstream seriously affecting Adelaide's water supplies, not to speak of the ecological disasters that would be likely to occur in Lake Alexandrina itself and the nearby Coorong. If, on the other hand, water is released for flushing to prevent this happening, it will have to be taken from irrigators (in the absence of heavy rain) with significant agricultural and human consequences. This is an example of the 'wicked problems' facing water management in Australia.

In the face of these challenges it is essential that Australian Governments continue their reform work.

The Murray-Darling Basin

The Murray-Darling Basin is the biggest river system in Australia. It covers in excess of one million square kilometres, extending through Queensland, New South Wales, Victoria and South Australia. The Basin contains Australia's three longest rivers: the Darling, Murray, and the Murrumbidgee. It supports approximately two million people and countless ecosystems. Approximately 70 per cent of irrigated land and irrigation water used in Australia occurs within the Basin. The Basin also accounts for between 30 and 40 per cent of the gross value of national agricultural production.

The exploitation of the water resources of the Basin has come at a cost. Over a little more than a hundred years, the resource base has deteriorated, largely as a result of agricultural production. River flows are no longer synchronised with natural flow patterns and have been reversed in some cases. The impact on the ecological functioning of the system is largely unknown. Table 4 indicates the changes to the hydrological balance of the Basin by comparing natural conditions (the estimates of the flow patterns prior to colonisation) with current conditions. The table illustrates how diversions account for about half of the runoff in the Basin. One consequence of water diversions is that the lower reaches of the Murray experience severe drought-like flows in over sixty per cent of years compared with five per cent under natural conditions.

The Governments of the Commonwealth, New South Wales, Victoria, South Australia, and the Australian Capital Territory signed an Intergovernmental Agreement in 2004 which is now known as the Living Murray initiative. The Agreement provides $500 million over five years to address the over-allocation of water in the Basin and the declining health of the river system. Recovered water will be set aside to improve the health of six ecologically significant assets: Barmah-Millewa Forest; Gunbower and Koondrook-Perricoota Forests; Hattah Lakes; Chowilla floodplain (including Lindsay-Wallpolla); the Murray Mouth, Coorong and Lower Lakes; and the River Murray Channel. Specific measures to recover water may include

investment in water infrastructure, programs to encourage behavioural change, and purchase of water on markets.

To achieve these goals, effective and coordinated water resource management is essential. As Professor Peter Cullen remarked in March 2007, "This crisis in The Murray-Darling Basin has been brought on by the climate shift and the serious drought we are now seeing, but the fact that we allowed the system to run to empty is another symptom of our failure to manage the waters of the basin in a sustainable way and now many communities and the environment are suffering what may be permanent damage". Cullen outlined some key actions: (1) a moratorium on any further extractions of water from the Basin until sustainable levels of extraction have been established; (2) the licensing and measurement of all extractions; (3) the establishment of a group of high-level scientific experts to advise a Murray-Darling authority body whose immediate task should be to propose the means of implementation of the Living Murray target (i.e. to return 1,500 GL of water to the Murray); (4) a single register of all water entitlements to make registries compatible across state borders; (5) seasonal allocations of water; (6) the appointment of an independent environmental manager to help protect the general health of the river system; (7) infrastructure investment; (8) greater integration of land and water management, and (9) water markets that include cities and towns.

Useful sources

Australian Water Resources 2005 is the Australian Government baseline assessment of water resources used in the National Water Initiative: **http://www.water.gov.au/**

The Australian Government's National Water Commission advises the Minister for Climate Change and Water on water related issues, information on the Commission and the National Water Initiative can be found here: **http://www.nwc.gov.au/**

Pigram, J.J. (2006). *Australia's Water Resources: From Use to Management*, Collingwood, Vic.: CSIRO Publishing. This book explores the development of water resource management in Australia.

See also Australian Conservation Foundation: **http://www.acfonline.org.au**

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