

# Water Accounting in Australia: Use and Policy Relevance

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## ABSTRACT

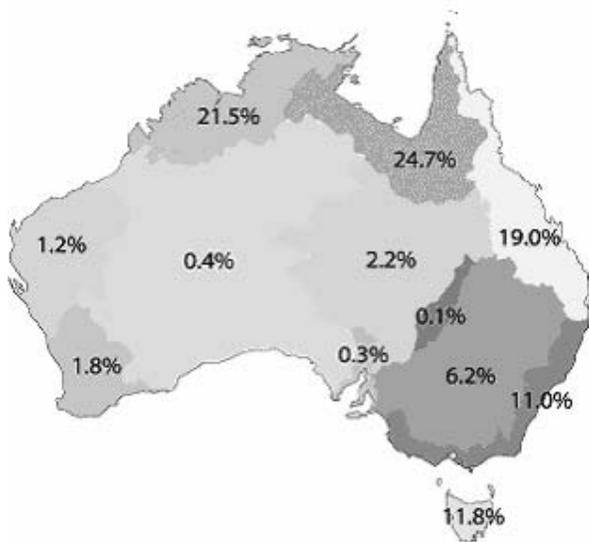
This paper broadly outlines the major policy issues facing Australia's water managers and what role the ABS water accounts have played in informing decision-makers. It starts by describing key aspects of water resources in Australia and then outlines the scope and coverage of the ABS water accounts. Selected results from the most recent water account are presented along with a brief summary of how the accounts have been used. Some of the issues faced by the ABS in compiling the water accounts are discussed and the ABS plans for water statistics in the future are presented.

## 1. INTRODUCTION

Water is a vital resource in every nation but in Australia water is scarcer than any other continent, except Antarctica. Australia also has the highest variability year-to-year of rainfall of all the continents and droughts are common (Linacre and Hobbs 1977). In addition, because Australia is a large country (nearly 7.7 million square kilometers) and spans nearly 33° degrees of latitude, there is enormous spatial and seasonal variation in rainfall. (see Bureau of Meteorology website [www.bom.gov.au](http://www.bom.gov.au), NLWRA 2001).

Australia's surface water resources are divided into 12 drainage divisions (Fig. 1), which are further divided into 325 surface water management units. In addition there are 535 ground water management units. Mean annual run-off for Australia is 387,000 gigitalitres (GL), but almost half (46%) is in the sparsely inhabited north of the country (NLWRA 2001).

**Fig. 1. Percent mean annual run-off by drainage division.**

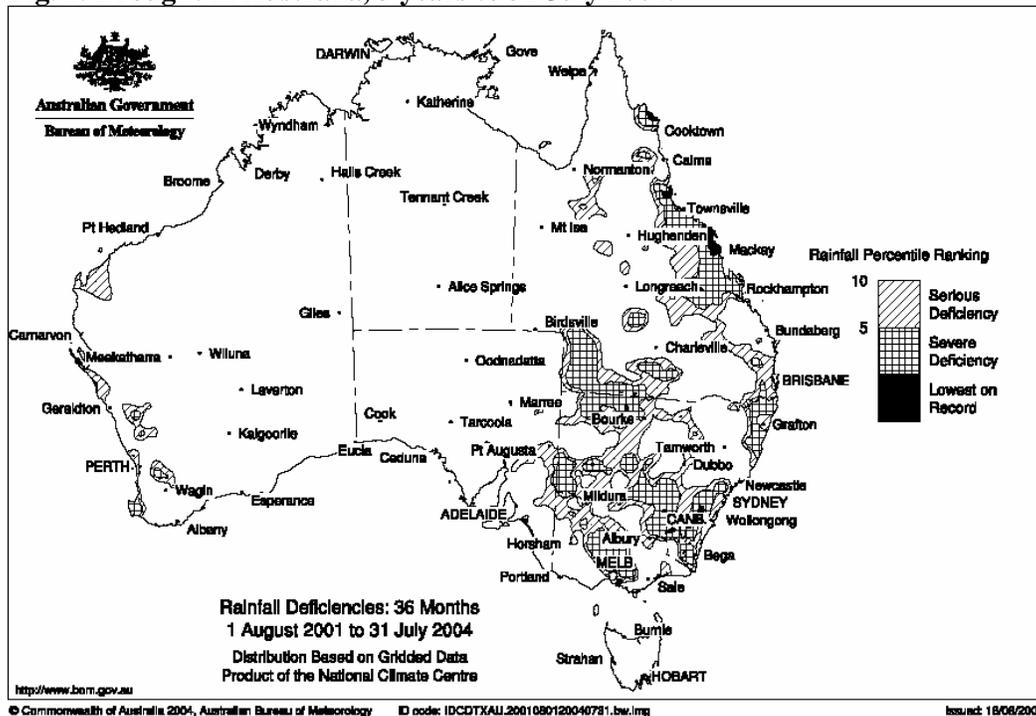


Source: NLWRA 2001 (after AATSE 1999)

Information on Australia's water resources, including information on water quality and water availability, has been summarised in the Australian Water Resources Assessment 2000 (NLWRA 2001). The latest water account from the ABS utilised some of these data, while the NLWRA (2000) made use of the first ABS water account.

At present water is the focus of intense interest to Australia's governments and the general public. This is partly because, southeast Australia, where the majority of the population is located (e.g. Sydney, Melbourne and Brisbane), has been in drought conditions for around three years (Fig. 2).

**Fig. 2. Drought in Australia, 3 years to 31 July 2004.**



**Definition of terms:** *Serious rainfall deficiency:* rainfall lies above the lowest five per cent of recorded rainfall but below the lowest ten per cent (decile 1 value) for the period in question. *Severe rainfall deficiency:* rainfall is among the lowest five per cent for the period in question.

As a consequence of the drought, there are restrictions on the use of water by households and industry (including agriculture) in many cities and most irrigation areas. The impact of the drought on the economy in 2002-03 is estimated to have been around -0.9 percentage points on the volume growth of GDP between 2001-02 and 2002-03 (ABS 2004, Cat. no. 5206).

While the recent drought has focused attention on water in Australia, concern over water resources extends back several decades. In 1994 the Council of Australian Governments (COAG) embarked on a series of reforms aimed at delivering the efficient and sustainable use of water in Australia. Since then information on all aspects of water use and management has been keenly sought. A range of agencies have been involved in supplying data and the ABS has been one of these agencies. In particular the ABS has found that the two editions of the *Water Account, Australia*

(ABS Cat. no. 4610.0) have and are being used at all levels of government, industry, by some sophisticated academic uses of information and by the media.

## 2. AUSTRALIAN WATER POLICY

Over the past decade COAG has played a pivotal role in the development of water policy in Australia. Recently (25 June 2004) the *Intergovernmental Agreement on a National Water Initiative* (COAG 2004) was signed by all but two Australian states. Paragraph five of the agreement contains a summary of the objectives:

*“The Parties agree to implement this National Water Initiative (NWI) in recognition of the continuing national imperative to increase the productivity and efficiency of Australia’s water use, the need to service rural and urban communities, and to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction. The objective of the Parties in implementing this Agreement is to provide greater certainty for investment and the environment, and underpin the capacity of Australia’s water management regimes to deal with change responsively and fairly (refer paragraph 23)”* (COAG 2004).

The agreement set out a broad plan and timetable to achieve these objectives. Significantly the agreement calls for the compilation of annual water accounts (paragraph 82), although the exact nature of these accounts is yet to be determined.

The policy questions of the COAG water reform agenda are many and varied but include:

- Are new water access entitlements and planning frameworks achieving better outcomes (environmental, economic and social)?
- Is water flowing to the highest value users?
- Are water providers achieving full cost recovery?
- Are water markets open and efficient?
- Are water uses and the water supply infrastructure that supports this economically efficient and sustainable?
- Is there consistency in water pricing across sectors and between jurisdictions?
- Are environment and other public benefit outcomes being achieved?
- What are the economic, environmental and social impact of changes in water resources allocation and use?

Water policy in Australia is supported by many government agencies. At the national level, sources of information and guidance on information collection come from:

- National Water Commission (NWC)
- National Land and Water Resources Audit (NLWRA)
- Executive Steering Committee on Australian Water Resources Information. (ESCAWRI)
- Commonwealth Scientific Industrial Research Organisation (CSIRO)
- Australian Bureau of Agricultural and Resource Economic (ABARE)
- National Competition Council (NCC)
- Productivity Commission (PC)
- Bureau of Rural Sciences (BRS)
- Bureau of Meteorology (BoM)

As can be seen from the above list there are many stakeholders in water statistics in Australia, and at present a clear structure for coordination has yet to emerge. All agencies involved in water statistics are waiting to see how the NWC will evolve. The NWC will have representatives from the Australian and State/Territory Governments, but is not yet established but the plan is for it to be functioning by the end of 2004 (see COAG 2004).

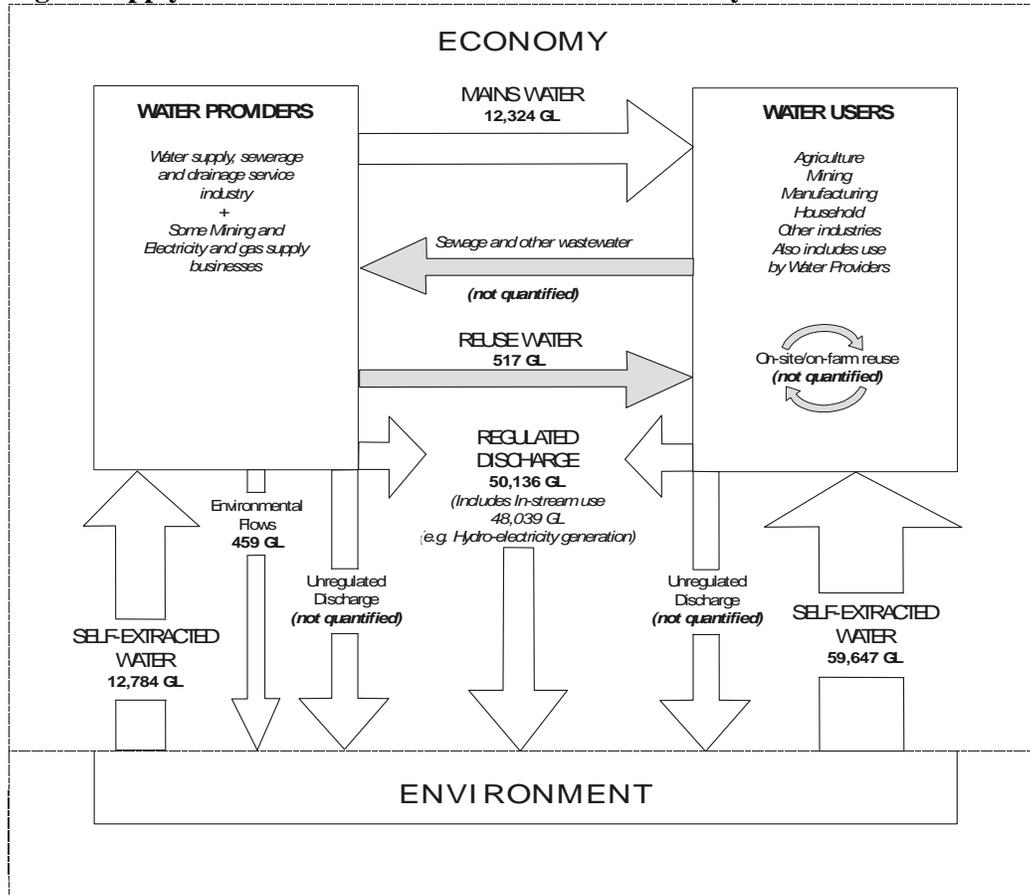
To date most statistical activity, and particularly that outside of the ABS, has focused on hydrology and water quality, with relatively few organisations concentrating on the economic and social aspects of water use. In Australia, water accounting is currently not being attempted outside of the ABS.

The ABS engages with many of these agencies in a variety of formal and informal avenues. For example, the ABS has recently established the Water Statistics User Group, which will advise the ABS on the statistical priorities relating to water. The advice from this group feeds into the ABS Forward Work Plan for Water (available from the authors). Similarly the ABS is represented on the National Land and Water Resource Audit (NLWRA) Advisory Council and the Executive Steering Committee of Australian Water Resources Information (ESCAWRI).

### **3. WATER ACCOUNT, AUSTRALIA**

The Australian water accounts are based on the System of Integrated Economic and Environmental Accounting (SEEA).

The scope of the Australian water accounts is limited mostly to the physical supply and use (flow) tables, although information on water stocks is included. Fig. 3 summarises the physical water flows in the Australian economy.

**Fig. 3. Supply and use of water in the Australian economy 2000-01.**

Source: ABS (2004). 2000-01 Water Account, Australia. ABS Cat. no. 4610.0.

The water accounts present information on the supply and use of water by industry for each Australian state and territory (except the Australian Capital Territory and New South Wales, which are combined). The industries used were those according to the Australian and New Zealand Standard Industrial Classification (ANZSIC). ANZSIC is aligned with the International Standard Industrial Classification of all Economic Activities (ISIC, see ABS 1993, ABS cat. no 1292.0). Summary data are presented in table 1. Other results can be found on the ABS website.

The first ABS water account (ABS cat. no. 4610.0), had as reference years 1993-94 to 1996-97 and was published in May 2000. This was the first time since the Australian Water Resources Council report on water use in 1985 (AWRC 1987) that comprehensive data on the water supply and use in Australia had been synthesised. The first water account was well received and was widely used by government policy departments and other information agencies. For example, by the National Land and Water Resources Audit (see NLWRA 2001).

The second ABS water account with the reference year 2000-01 was published in May 2004. The second water account had a modified format and included more detailed industry splits, more information on water stocks and drew on a wider variety of information to assist with data interpretation. It also included a chapter on current

and emerging issues (i.e. environmental flows and water trading). A wide range of users, including government agencies, industry bodies and academic researchers, eagerly awaited the second account.

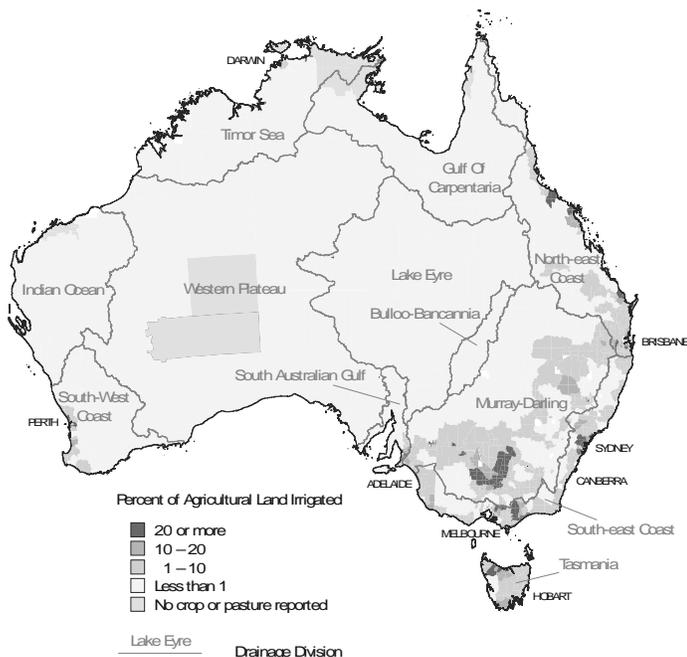
**Table 1. Water consumption by industry, 2000-01**

	<i>Aust. (total)</i>	<i>NSW /ACT</i>	<i>Vic.</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas.</i>	<i>NT</i>
	GL	GL	GL	GL	GL	GL	GL	GL
Agriculture	16660	7322	3725	3454	1302	565	222	70
Forestry (a)	27	4	4	2	1	12	2	-
Mining	401	52	7	109	12	195	21	5
Manufacturing	866	179	249	181	85	83	79	9
Electricity and gas	1688	59	1536	70	2	19	-	1
Water supply	1794	676	745	216	24	114	9	9
Other	1292	453	402	178	40	176	25	21
Household	2181	679	472	501	181	245	59	45
<b>Total</b>	<b>24909</b>	<b>9424</b>	<b>7140</b>	<b>4711</b>	<b>1647</b>	<b>1409</b>	<b>417</b>	<b>160</b>

(a) Forestry, fishing and services to agriculture

In the water account the main supply and use (flow) tables are found in one chapter of the publication. Other chapters examine different sectors of the economy and use other information to aid interpretation. For example, the chapter on agriculture contains a map showing the percent of crops and pastures that are irrigated (fig. 4) and a table of the gross value of irrigated agricultural production (table 2).

**Fig. 4. Percentage of crops and pastures irrigated, 2000-01.**



**Table 2. Gross value of irrigated agricultural production, 2000-01**

	1996-97	2000-01							
	Aust. \$m	Aust. \$m	NSW/ ACT \$m	Vic. \$m	Qld \$m	SA \$m	WA \$m	Tas. \$m	NT \$m
Livestock other agriculture*	-	1501	322	452	486	110	153	64	4
Dairy*	-	1499	178	956	123	126	38	78	0
<i>Subtotal</i>	<i>2540</i>	<i>2999</i>	<i>500</i>	<i>1408</i>	<i>608</i>	<i>236</i>	<i>191</i>	<i>142</i>	<i>4</i>
Vegetables	1119	1817	228	465	545	248	186	143	2
Fruit	1027	1590	223	370	584	235	102	45	31
Grapes	613	1355	225	328	15	685	82	9	12
Sugar	517	284	1	0	278	0	5	0	0
Cotton	1128	1222	848		373		1		
Rice	310	350	346	4	0	0	0	0	0
<b>TOTAL AGRICULTURE</b>	<b>7254</b>	<b>9618</b>	<b>2371</b>	<b>2574</b>	<b>2402</b>	<b>1405</b>	<b>567</b>	<b>339</b>	<b>49</b>

\*Not separated in 1996-97

#### *Data sources*

Over a hundred sources of data were used in the 2000-01 water account. There were three ABS surveys used in the 2000-01 water account, namely the 2001 Environment Management Survey (of mining and manufacturing industries), the 2001 Agricultural Census and the 2001 Water Provider Surveys (= ISIC 41 and 90). Additional information on water use was collected by the ABS from the electricity and gas and paper product industries. Three surveys by industry associations were also important. These surveys were conducted by: the Water Supply Association of Australia (WSAA); the Australian Water Association (AWA) and; Australian National Committee on Irrigation and Drainage (ANCID). All surveys were in respect on 2000-01.

Other data sources for the water account included lists of licensed water users supplied by state and territory government departments, list of licensed water discharges from state and territory environment protection agencies and information about regional water application rates for different crop types from state and territory agricultural agencies. Various data were obtained from the Bureau of Meteorology, Commonwealth Scientific and Industry Research Organisation (CSIRO), GeoScience Australia, the NLWRA as well as reports by university academics and industry associations.

#### **4. USE OF THE WATER ACCOUNTS**

The water accounts have and are been used by a range of people and agencies. Within governments they are being used for policy documents, including “*Securing Our Water Future Together*” (2004 Victorian Government Department of Sustainability and Environment). They have also been used by government agencies in economic analyses, for example Appels *et al* (2004).

The water accounts are also used by Australian industry. For example, representatives from the irrigation water supply industry (ANCID) and several large water providers have used data from the water accounts to measure their contribution, in terms of volume of water, to the water supply industry. Estimates of water consumption by ANZSIC from the water account have also been useful for water providers to better understand their customers' activity in particular to predict future demand for water.

The usefulness of water accounts is also recognised by their inclusion in the COAG (2004) agreement on water reforms. While the nature of the water accounts proposed is yet to be detailed, and it is likely that the scope will be limited for pragmatic purposes, their inclusion is an indication of their value to government decision-makers.

A number of academics have also made use of the accounts. For example, Lenzen and Foran (2003) used the first water account for an input-output analysis of water use in Australia, while Wittwer (2003) created an estimate of water use for the Murray-Darling Basin (a region of particular interest in Australia). Foran and Poldy (2002) used the water account to make projections about water use to the year 2050.

## 5. IMPROVEMENTS TO THE WATER ACCOUNTS

There are five areas where the water account can be improved:

- Comparability and time series
- Timeliness
- Provision of regional estimates
- Provision of comprehensive economic/financial information on water supply and use
- More integration with other data

The areas are outlined more fully below.

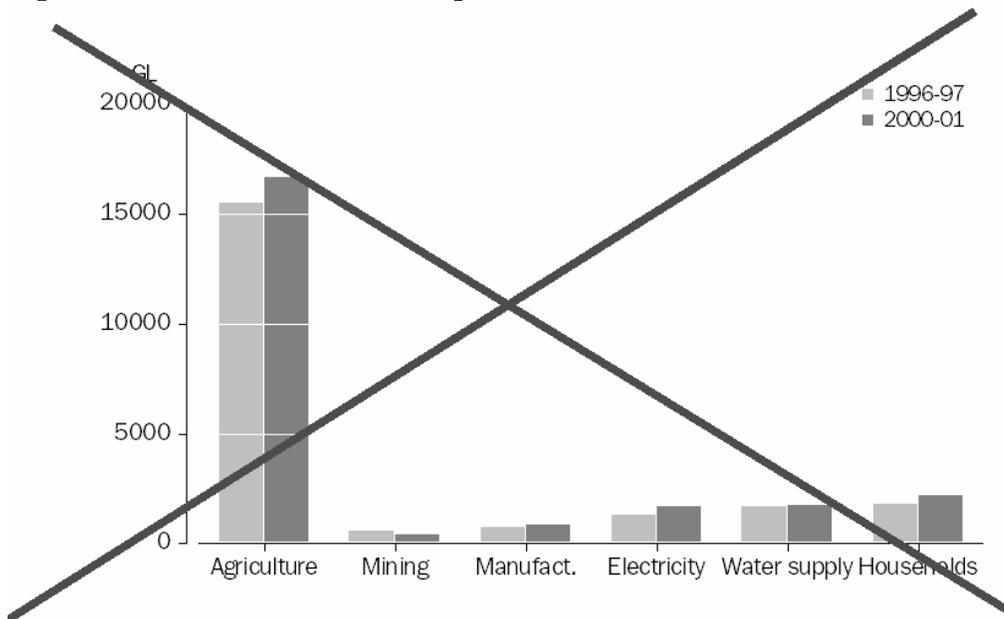
### *Comparability and time series*

Data on water supply and use in Australia has been consolidated three times in the past two decades but unfortunately a true time series does not exist.

Data from 1985 in the AWRC (1987) report are not comparable to the data contained in either the first or second ABS water account. This is due to different concepts and classifications, data sources and methods being used. As the work was done by different agencies, in different decades this is not surprising.

What may be surprising to some is that much of the data in the two ABS water accounts are not comparable. Between 1996-97 and 2000-01 the measuring (i.e. increased use of water meters), monitoring and reporting of water supply and use improved considerably. There were other changes, particularly in the methods and data sources used by the ABS, with the second account using far less modeled data than the first. These resulted in higher quality estimates but a lack of comparability. It is also important to note that the climate plays an important in water use in Australia and that this too varied between the reference periods.

**Fig. 4 Lack of a true water consumption time series**



*Timeliness*

The first and second water accounts were produced approximately three years after the end of the reference period. This was due largely to availability of information and the large number of data sources to be reconciled.

*Regional estimates*

Almost all decision makers and researchers have stressed the need for regional water use. The regions for which information are usually required are water catchments or drainage divisions, which seldom match the geographies used by the ABS. ABS data can be modeled to match these boundaries but ideally the data would be collected in such a way as to allow direct estimates for specific regions.

*Economic/financial information*

Several organisations have highlighted the lack of information available on economics of water use in Australia. The water accounts have included information on the gross value of agricultural production from irrigated land, but ideally a net measure would be calculated and the relative contribution that water makes to production and productivity would be identified. Information on the price paid for water and the value of water delivery and storage infrastructure is needed to assess whether water consumers cover the full cost of water supply. This is particularly relevant in rural areas where this has not been the case in the past (see PC 2003).

*More integration with data currently out of scope with the water accounts*

Currently the water accounts present data on the supply and use of water in the Australian economy. It is hoped that the ABS will eventually expand the theoretical scope of the water accounts to cover hydrological and meteorological aspects of water in the environment. While the ABS will not collect the data itself it seems reasonable to incorporate this data where (and when) it is available.

**6. THE FUTURE**

The planned ABS involvement in water statistics is outline in the *ABS Forward Work Plan for Water* (available from the authors). In brief the ABS is proposing to produce water accounts at four yearly intervals as well as providing annual statistics on:

- The water supply industry
- Agricultural water use
- Energy and gas industry water use
- Household water use

Together these sectors represented just under 90% of water consumption in Australia in 2000-01. The annual statistics will need to be supported by increased ABS survey activity and in particular:

- Adding questions on water use to the annual Agricultural Survey (or the proposed Natural Resource Management Survey)
- Establishing an annual Water Provider Survey (of both water supply and use)
- Establishing an annual Electricity and Gas Industry Water Use Survey
- Possibly expanding the Environment Management Survey to cover the whole of the economy (only mining and manufacturing were covered in 2001)

This expanded survey program was put to the inaugural meeting of ABS Water Statistics Users Group (WSUG) in August 2004 and given broad support. The program will now proceed through internal ABS planning processes.

Also presented to WSUG was the *Draft Water Information Development Plan* (available from the authors). The draft plan broadly outlines the main suppliers and users of water data in Australia and seeks to put the ABS collectivity into the context of all water related information.

## 7. REFERENCES

AATSE 1999, *Water and the Australian Economy*, Joint project of the Australian Academy of Technological Sciences and Engineering and the Institution of Engineers Australia.

ABS (Australian Bureau of Statistics) 1993. Australian and New Zealand Standard Industrial Classification – ANZSIC. ABS cat. no. 1292.0/New Zealand cat. no. 19.005.0092.

ABS (Australian Bureau of Statistics) 2000. Water Account for Australia, 1993-94 to 1996-97. ABS Cat. no. 4610.0

ABS (Australian Bureau of Statistics) 2004 Australian National Accounts: National Income, Expenditure and Product, March Quarter 2004, ABS Cat. no. 5206.0. Summary at: <http://www.abs.gov.au/ausstats/ABS@.nsf/mf/5206.0>

ABS (Australian Bureau of Statistics) 2004. Water Account, Australia 2000-01. ABS Cat. no. 4610.0. Summary at: <http://www.abs.gov.au/ausstats/ABS@.nsf/mf/4610.0>

Adams, P.D., Horridge, M., Madden, J. and Wittwer, G. 2002. Drought, regions and the Australian economy between 2001-02 and 2004-05. Centre of Policy Studies, Monash University. At: [www.monash.edu.au/policy/archivep](http://www.monash.edu.au/policy/archivep)

Appels, D., Douglas, R, and Dwyer, G. Responsiveness of Demand for Irrigation Water: A focus on the Southern Murray-Darling Basin. Productivity Commission Staff Working Paper. At: <http://www.pc.gov.au/research/swp/rdia/rdia.pdf>

AWRC (Australian Water Resources Commission) 1987. 1985 Review of Australia's Water Resources and Water Use. Vol. 1&2 Water Resources Data Set, Australian Government Publishing Service, Canberra

Chesson, J., Deane, D., Gilmour, J., 2003. Indicators of Agricultural Water Quality and Water Use: Australia's experience. Report to OECD Expert Meeting on Agricultural water quality and water use indicators. Gyeongju, Korea. 7-10 October 2003

COAG (Council of Australian Governments), 2004. Intergovernmental Agreement on a National Water Initiative. At: [http://www.coag.gov.au/meetings/250604/index.htm#water\\_initiative](http://www.coag.gov.au/meetings/250604/index.htm#water_initiative)

Foran, B. and Poldy, F., 2002. The future of water in Future Dilemmas: Options to 2050 for Australia's Population, technology, resources and environment. CSIRO Sustainable Ecosystems, Working paper Series 02/01.

Lenzen, M. and Foran, B., 2001. An input-output analysis of Australian water usage. Water Policy: 3, 321-340.

NLWRA (National Land and Water resources Audit 2001. Australian Water Resources Assessment 2000. NLWRA, Canberra. [http://audit.ea.gov.au/ANRA/water/docs/national/Water\\_Contents.html](http://audit.ea.gov.au/ANRA/water/docs/national/Water_Contents.html)

Productivity Commission, 2003. Water Rights Arrangements in Australia and Overseas. Productivity Commission Research Paper. Available from [www.pc.gov.au](http://www.pc.gov.au).

Senate Environment, Communications, Information Technology and the Arts Committee 2002. The Value of Water: Inquiry into Australia's management of urban water. [http://www.aph.gov.au/Senate/committee/ecita\\_ctte/water/report/index.htm](http://www.aph.gov.au/Senate/committee/ecita_ctte/water/report/index.htm)

Victorian Government Department of Sustainability and Environment 2004. Securing Our Water Future Together. Victorian Government White Paper. [www.dse.vic.gov.au](http://www.dse.vic.gov.au)

Wittwer, G., 2003. An outline of TERM and modifications to include water usage in the Murray-Darling Basin. Centre of Policy Studies, Monash University.