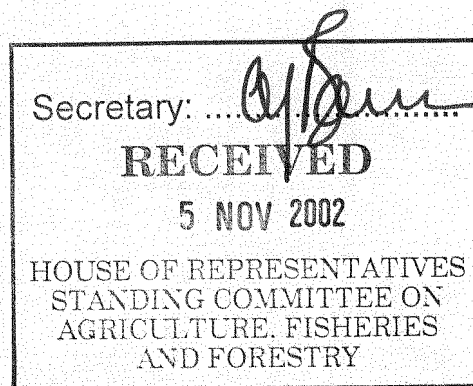


South Australian Government submission
to the
House of Representatives Standing Committee
on
Agriculture, Fisheries and Forestry
inquiry into
Future Water Supplies for Australia's
Rural Industries and Communities

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**Government
of South Australia**

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Executive Summary and Recommendations

In some areas of Australia, including in the Murray-Darling Basin, and parts of South Australia, extractive water use is largely being met at a considerable cost to the environment. There is growing scientific evidence and community awareness that past water management practices are not sustainable for such areas, and that change is required to provide for healthy river systems, and for surface water and groundwater resources, which are needed to underpin the social, economic and environmental prosperity of Australia.

The South Australian Government takes the key role in water resources management in the State, primarily through the development of legislation, policies and strategies that encourage the appropriate use and protection of the water resource. The Government is committed to restoring the health of the rivers, streams, floodplains, wetlands and groundwater resources of the State, so as to ensure there remains a balance between the economic, social and environmental requirements of each water resource.

The plight of the environmental health of the River Murray, not just in South Australia, but within the Murray-Darling Basin, is of the highest priority for the SA Government. South Australia's extractions from the River Murray account for only about 5 percent of the total extractions from the Murray Darling Basin. The listing of the River Murray as the number one endangered place in Australia is timely and highlights the warnings that the Government has issued about the condition of the River Murray. The fact that four states nominated the River Murray is important and demonstrates the common understanding of the threats facing the river and the need to work cooperatively to find solutions before it's too late. The State Government's approach to the River Murray, including the development of a Water Allocation Plan for the River Murray in South Australia, the recent agreement with Victoria to establish an Environmental Flows Fund that will deliver up to an extra 30 Gegalitres of annual water down the River, and irrigation area rehabilitation initiatives, are good examples of how the trade-offs between economic, environmental and social interests are being managed.

Groundwater is also an important resource in parts of the State. The majority of the State's good quality groundwater is in the lower South East. In other areas, such as Eyre Peninsula, good quality water supplies are limited. The Government has released a Master Plan for Eyre Peninsula aimed at alleviating long-standing water supply problems in that area. Increased demand management, water reuse and desalination of the Tod Reservoir are key points of the Plan. The Government has also significantly increased funding for regional surface and groundwater monitoring in South Australia.

Development of policies and strategies for rural water management requires recognition that we live in an environment which is not 'static'. Social attitudes can change, which, to a large degree, reflects changing environmental and economic circumstances at global, national and regional levels. Global warming and concerns over sustainability impose an additional imperative on Governments to act responsibly and cautiously in regard to the allocation of finite water resources. This requires an increased understanding by all water users that allocations may need to

vary over time, and greater understanding of the nature of water access rights. Greater water use efficiency, encouraged by the CoAG Water Reform Framework, minimises the impact on rural communities reliant on irrigation water for their economic prosperity.

The Commonwealth has helped to improve water resource management, particularly through funding for initiatives that encourage improvements in natural resource management.

The role of the Commonwealth in rural water management should be to assist the States to effectively manage their resources, by ensuring they continue the program of implementation of the CoAG water reforms. The Commonwealth can consider strengthening linkages and partnerships with the States, Local Government and other local natural resource managers.

The Commonwealth has, at times, assisted the States in the provision of improved services to targeted sectors of the rural community, such as assistance for converting irrigation channels to piped systems, in some areas, to reduce water losses. Commonwealth agencies, including the Bureau of Meteorology, and the CSIRO, are also involved in data collection and research in rural areas and, via its agencies the Commonwealth also provides a range of grant funding programs that could target areas that would assist rural communities. Through such mechanisms, and in light of the Commonwealth's powers in regard to Aboriginal Affairs, Housing and Education, the Commonwealth is in a position to assist the States to achieve required structural change which is in keeping with the long-term strategic interests of the States and the Nation.

Suggested ways in which the Commonwealth might assist the States to improve water management in rural communities are:

1. The Commonwealth should consider approaches made by States or Territories for strategic structural adjustment assistance, in those areas that require it, according to a set of pre-agreed principles. The report by the Natural Resource Management Ministerial Council Standing Committee's Chief Executive Officers Group on Water, sets out such draft principles. (Page 12).
2. The Commonwealth could consider resourcing appropriate Commonwealth agencies, and/or assisting the States, to develop and keep up to date water resource projections/scenarios, that account for climate change. (Page 14).
3. The Commonwealth should in collaboration with the States and Territories develop a more integrated and strategic approach to improve access to data. As part of this the Commonwealth should consider improved monitoring in areas of hydrological significance in outback Australia. (Page 15).
4. The Commonwealth should consider re-establishing funding schemes to help facilitate the provision of adequate water infrastructure to support sustainable regional development. (Page 16).

5. The Commonwealth could consider increasing funding for research into:
 - cost-effective, low-technology solutions for improving the quality of water supplies, with a focus on drinking water supplies
 - cost-effective wastewater services to rural and remote communities, with an emphasis on safe reuse for appropriate purposes (Page 17).
6. The Commonwealth could further assist the investigation and coordination of regulatory approaches, which would encourage the uptake of appropriate water conserving devices or practices in rural communities. (Page 18).
7. The Commonwealth could play a greater role in educating the community, professionals and trades in the areas of water conservation and efficient use of water. It could also encourage community participation, for example by:
 - educating the community about ways to conserve water
 - encouraging industry to develop and implement new technologies that conserve water (Page 19).

INTRODUCTION

This submission includes a brief discussion on sustainability, ecologically sustainable development and an overview of South Australia's water resources, followed by two sections:

- **Section 1**, discusses water access rights, adaptive management and sustainability, which are issues of major strategic importance to South Australia.
- **Section 2**, addresses other issues relating to the inquiry's Terms of Reference of relevance to South Australia, including climate change, rural development, rural community water services (including services to Aboriginal communities) and water conservation.

The sections address issues relating to the terms of reference of the inquiry, including:

- potential approaches the Commonwealth could take to improve the adequacy and sustainability of supply of water to rural communities
- potential for the Commonwealth to improve scientific knowledge required for climate variability and better weather prediction, including the reliability of forecasting systems and capacity to provide specialist forecasts.

TOWARDS SUSTAINABILITY

Ecologically sustainable development (ESD) requires us to use, conserve and enhance our natural resources so that ecological processes are maintained now and in the future. They include the need:

- for Governments, industry and consumers to balance economic, environmental and social values, and accordingly, to pursue an integrated approach to decision making on issues of resource use
- to provide for equity within and between generations (inter-generational equity).

The State Government has established core values and developed policies for sustainable water management, which it has incorporated into the *State Water Plan 2000*, which can be downloaded from:

<http://www.dwlbc.sa.gov.au/water/publications/waterplan.html>

DEFINING ECOLOGICALLY SUSTAINABLE WATER USE

From an environmental perspective all water in a river ecosystem constitutes the environmental flow regime. However, environmental water requirements can be regarded as the water regime needed to sustain the ecological values of natural aquatic ecosystems, including their biological diversity, at a low level of risk.

Management of water use should require water to be used in an ecologically sustainable way. This should seek to ensure that the environmental water provisions match the water requirements. Where this is not achievable, the aim should be to increase the environmental water provisions progressively through establishing efficient water use and demand reduction targets, and encouraging water to appropriate uses that achieves the greatest economic return per kilolitre used.

In South Australia the primary legislation for managing water resources is the *Water Resources Act 1997*. The object of the Act is to establish a system for the use and management of the water resources of the State, that ensures the use and management of those resources sustain the economic and social well being of the people of the State and facilitate the State's economic development, while (among other requirements) protecting the ecosystems that depend on those resources and ensuring that those resources are able to meet the reasonably foreseeable needs of future generations.

Australian Water Resources Assessment 2000 provides information on the South Australian methodology used to determine sustainable water provision estimates.

OVERVIEW OF SOUTH AUSTRALIA'S WATER RESOURCES

Of all States in Australia, South Australia probably has less water of the right quality in the right place, when we need it most. Surface water production within the State is relatively limited and predominantly occurs in the Mount Lofty Ranges and the Flinders Ranges. The State's major surface water resources are in the River Murray and the Lake Eyre Basin, the catchments for both of which extend beyond the State's borders. The Murray is South Australia's most important surface water resource. It supplies almost half of the State's average annual water use of 1240 GL, up to 90 percent of Adelaide's consumption in dry years, and virtually 100 percent of water to many agricultural users and rural communities. It provides water for an extensive irrigation industry and is also a major focus for tourism. It also hosts important wetland complexes, including two in South Australia of international importance under the Ramsar Convention: the Coorong/Lower Lakes, and the Chowilla wetland complex.

Groundwater is the major natural source of water in large parts of the State, with the quantity and quality varying considerably from region to region. The South East of the State has the largest supply of good quality groundwater. This is, by a long way, the predominant water resource of the South East, and is increasingly being relied upon for agricultural, industrial, domestic and recreational uses. In the north of the State, the Great Artesian Basin is an important resource for pastoralists, mining companies and very significant ecosystems centred on mound springs. In both regions, these groundwater resources are also shared with other states; South Australia has entered into agreements with the relevant States to cooperatively manage and equitably share these resources. Groundwater is also an important resource for Eyre and Yorke Peninsula and for some remote area communities.

State Water Plan 2000 provides a detailed description of the use and condition of South Australia's water resources on a state-wide, and region by region, basis.

Additional information on the State of South Australia's water resources is to be found in the recent South Australian submission to the Environment, Telecommunications, Information Technology and the Arts (ECITA) References Committee inquiry into urban water management. The ECITA submission also provides information on South Australian water-related initiatives relating to water management.

SECTION 1 – ISSUES OF STRATEGIC IMPORTANCE

WATER ACCESS AND ADAPTIVE MANAGEMENT

Water Access (Property) Rights

The CoAG Water Reform Framework is the driver for major change in water resource management. Among a suite of reforms, the Framework requires recognition of the environment as a legitimate user of water, adaptive management of the resource, and that adjustment be made in relation to over-allocated systems. It further requires the separation of water property rights from land-based property rights and establishment of trading arrangements in water allocations.

The separation of the water rights and land property rights, and the capacity for the water right to be traded, effectively establishes a market for water that has significant economic and financial ramifications. The term “property rights”, used in the CoAG Water Reform Framework, is not specifically defined; in common usage, people associate property with *ownership*, whereas rights to water have historically been rights to *access*.¹ Accordingly, this has triggered a need to clearly define water access rights.

In response to the CoAG Framework, each of the State’s water laws now provide a means by which water access rights are specified and can be traded. However, it is clear that, during this transitional period of reform, there is a lack of information in the community about the nature of property rights as they concern water, including responsibilities of water users.

South Australia has separated water and land entitlements and in prescribed areas of the State has established water access rights to individuals, in the context of statutory Water Allocation Plans, which are required to ensure that the rate of use of the resource is sustainable.

The Explanatory Documents to the *State Water Plan 2000* explains South Australia’s position in relation to the nature of water and property rights, and ‘who owns water’.

Adaptive Management and Adjustment

Right of access to water lends itself to a type of right quite different to traditional and commonly understood concepts of property right. Whereas land can be surveyed, registered and is unlikely to change as an entity over time, water entitlements cannot have the same form of guarantee over time.

Different situations that may drive a need for adjustment of access rights to water include: climate change; land-use change; changing community values; better understanding of water resource sustainability and, as a consequence of long-term

¹ For further discussion see ‘Who owns water?’ *State Water Plan 2000 Explanatory Documents*

monitoring, recognition that historic over-use of the resource has occurred in some areas.

It is now clear that the water resources of parts of Australia have achieved short-term economic gain, at cost to the environment and long term sustainability of the resource. The plight of the River Murray, not just within South Australia, but within the entire Basin, is a particular concern for this State². The Murray Darling Basin Ministerial Council has developed a set of 15 high-level objectives in relation to River health and quality, environmental flows and human dimensions (Appendix 1).

The extraction of groundwater resources of the Northern Adelaide Plains and Padthaway in the South East of South Australia, exceed the long term sustainable limits of those resources, and concerns regarding over-use are also emerging in the Mount Lofty Ranges, Eyre Peninsula and Arid Areas.

Ongoing, adaptive management is therefore important. It may be helpful to view water access rights in the context of shares of a resource rather than as specific quantities.

Compensation and Structural Assistance

The notion of compensation hinges on the extent to which water allocations are comparable to other forms of property right. The South Australian view is that water property rights are more appropriately recognised as a right to access water.

The Commonwealth Government has recently reaffirmed its position that the matter of compensation is a State/Territory responsibility and that there may be circumstances in which the Commonwealth contributes funds to support structural adjustment. South Australia agrees with that position.

The distinction between compensation and structural adjustment assistance is important. Compensation is a legal matter governed by statute. The matter of compensation for adjustment of the water access right is already adequately dealt with in State legislation. The South Australian position on access rights to water, processes for adjustment of those rights and any related question of compensation, is clearly expressed in the *Water Resources Act 1997*. There is no case for compensation where adjustments are necessary and pursued through the mechanisms set down in that Act. The Water Resources Act, like those in most other jurisdictions, has only recently been totally overhauled and modernised to suit the contemporary situation.

Structural adjustment assistance is a policy option used to assist specific sectors or geographic regions to adjust to a desired outcome where the impact of that policy outcome is such that normally autonomous adjustments in response to changing conditions cannot reasonably be made.

² Appendix 1 discusses environmental flows and the River Murray

Recommendation 1. The Commonwealth should consider approaches made by States or Territories for strategic structural adjustment assistance, in those areas that require it, according to a set of pre-agreed principles. The report by the Natural Resource Management Ministerial Council Standing Committee's Chief Executive Officers Group on Water, sets out such draft principles.

SECTION 2 – OTHER ISSUES

Climate Change

The issue of global climate change was mentioned in Section 1 in relation to the different nature of land property rights and water property rights, and structural adjustment.

Latest projections of climate change for South Australia indicate substantially hotter and drier conditions over most of South Australia by 2030 to 2070 (Table 1), with likely decreases in surface runoff and groundwater recharge, increased salinity and water demand. There is expected to be lower agricultural productivity in Australia; in contrast some agricultural competitors, such as Canada, are expected to increase their productivity as a result of global warming.

Table 1 - Forecast Temperature Changes in Australia by 2030 and 2070

	Southern South Australia		Northern South Australia	
Year:	2030	2070	2030	2070
Temperature rise, °C	0.5 – 1.5	0.8 – 5	0.5 – 2	1 - 6.5

Predicted impacts on South Australia include:

- greater occurrence and severity of droughts
- natural and agricultural vegetation becoming more sparse, with the prospect of different species becoming predominant
- reduction in average annual runoff in the Murray Darling Basin, reduced runoff from the Mount Lofty Ranges water supply catchments and reduced aquifer recharge
- increased stream salinity
- increased rainfall intensity and frequency of floods
- increased demand for water
- increased viability for water borne disease vectors.

Climate change has significant implications for Australia's future economic, social and environmental wellbeing. The national cost of reduced water reliability and deterioration of the water resource, in terms of higher agricultural and industrial production costs, could be considerable and would impact on the competitive advantages of these industries.

The impact of climate change will have particularly significant implications for South Australia due to the State's reliance on shared surface and groundwater systems. It has critical implications for the health of the River Murray, the resources of which are already severely over-allocated, and for other areas, including the South East and Eyre Peninsula. Unless we plan for and implement measures to combat the effects of climate change, we will see an accelerated deterioration in the health of

Australia's riparian ecosystems, further stress on some groundwater resources, and a significant loss in agricultural productivity. The Commonwealth should provide stronger leadership for a national approach in relation to combat climate change.

The time frame for significant impacts of global climate change to occur is expected to be similar to that for River Murray salinity impacts. The River Murray Salinity Strategy has not taken account of climate change and there is a need to develop forecasts for Australia's water resources for the predicted range of climatic scenarios.

Notwithstanding predicted long-term incremental change, there is a need to plan for the possibility of greater frequency of weather events of comparatively short duration. Rivers and fractured rock groundwater systems exhibit rapid responses to rainfall (or droughts) over short time frames; climate change is also expected to result in increased rainfall intensities which may increase the frequency and severity of floods. The effects of severe events on local communities reliant on surface flows or groundwater resources, which respond rapidly to weather events, could be very significant. For example, the Clare Valley, which supports a significant viticulture industry that is partly dependent on water sourced from a fractured rock aquifer, could well be threatened by a drought made more extreme and prolonged as a consequence of climate change. The ability to adjust water allocations to account for extreme weather events of comparatively short duration, and longer-term impacts of climate change, is a fundamental component of sustainable water resource management.

Improved predictions of rainfall probability for short to medium term outlooks (eg 10-20 years) would significantly help our understanding of resource capacity and sustainability. Commonwealth Government investment in enhancing the climate predictive capability of the CSIRO and Bureau of Meteorology, would contribute to the assessment of water resource capacity in regional Australia.

The South Australian Government is funding a study to better understand the implications of climate change to water resources generated in South Australia. The State Government has also initiated a project which will develop an integrated water resources plan for Adelaide. The project will consider opportunities for increased reuse of urban wastewater and stormwater in rural areas adjacent to Adelaide.

Recommendation 2. The Commonwealth could consider resourcing appropriate Commonwealth agencies, and/or assisting the States, to develop and keep up to date water resource projections/scenarios, that account for climate change.

Data Collection

An issue central to that of good water resource management and the improved prediction of climate change, is that of ongoing data collection, and dissemination of information.

Appendix 2 discusses specific issues on the collection, management and access of data, including in relation to:

- the paucity of monitoring stations in parts of rural Australia
- the national land and water resources audits
- the collection and acquisition of data by Commonwealth and State agencies.

Possibly for reasons of convenience of access and cost, rainfall monitoring tends to be concentrated in populated areas and is biased towards regions with low topography. These are not necessarily hydrologically significant regions suited to the estimation of total catchment rainfall. In some instances the paucity of data has resulted in under-estimating the frequency and magnitude of flooding in some rural areas, which has led to greater-than-anticipated damage to roads and rail lines, including those of the Commonwealth.

There is a need for a more integrated and strategic approach that would allow collection agencies to commit to long term data collection programs, and improve access of data between agencies and to the community.

Recommendation 3. The Commonwealth should in collaboration with the States and Territories develop a more integrated and strategic approach to improve access to data. As part of this the Commonwealth should consider improved monitoring in areas of hydrological significance in outback Australia.

Irrigation Infrastructure

The Commonwealth has invested in water efficiency schemes under the Great Artesian Basin Sustainability Initiative and NHT projects such as the Highlands Irrigation Scheme in the Riverland South Australia, to convert open channel water distribution and drainage systems with high water losses to efficient piped systems. These strategic investments can provide significant water savings for additional productive development or improving the security of existing supplies. They also provide savings to redress the lack of water for environmental flows or to address groundwater sustainability issues and dry land salinity problems associated with rising groundwater.

The Commonwealth has previously funded programs through the Country Water Supply Improvement Program (COWSIP) and the National Landcare Program during the 1980s and early 1990s, to provide funding in partnership with State Governments and local councils for the provision of rural water supplies and waste water disposal systems. However, the Commonwealth has retreated from funding these types of infrastructure schemes, defining it as a State and local government responsibility.

Recommendation 4. The Commonwealth should consider re-establishing funding schemes to help facilitate the provision of adequate water infrastructure to support sustainable regional development.

Rural Community Water Services (including those to Aboriginal Communities)

Appendix 3 provides information on rural community water infrastructure in South Australia.

The cost of providing water services to rural areas is generally much higher than metropolitan areas due to diseconomies of scale, remoteness and poor quality of local water resources. The lack of trained staff required to operate and maintain water services in remote communities is perceived by some as an issue that may limit the use of relatively complex water systems. As a result, many rural towns suffer from a deficiency in reticulated water and waste water services that impede regional economic development.

Service delivery responsibilities to Aboriginal communities falls across both Commonwealth and State governments. A 1989 bilateral agreement provides for capital and recurrent funding from Commonwealth and State Governments to support infrastructure development, maintenance and operational costs.³

Sufficient quantity of water is often not available to readily meet all reasonable needs of remote Aboriginal and non-Aboriginal communities. Water quality is also an issue. Salinity, for example, can be quite high in bore water supplies, and is a problem for many Aboriginal and non-Aboriginal rural communities⁴. In the Mid- and Far North of South Australia bore water salinity is about four times the recommended National Health and Medical Research Council guidelines for drinking water based on taste considerations. Water hardness, iron and nitrate concentrations are also issues in some areas.

The remoteness of some communities has been a hurdle in testing for possible microbiological contamination of water supplies, as samples need to be refrigerated and returned to a testing laboratory within a few hours.

Roof runoff in some rural communities, including Aboriginal communities, is sometimes unsuitable as a substitute potable supply, without precautions, due to contamination by dust and possibly contamination by micro-organisms.

³ Arrangements are currently under way for the Land Holding Authorities representing the 18 communities to procure contracted supply authorities which will bring operations in line with regulatory frameworks. Some revision to the existing bilateral agreement for the provision of essential services to Aboriginal communities within South Australia would underpin the regulatory proposal.

⁴ In some locations, for example at Yalata, Penneshaw and Roxby Downs, desalination plants have been installed. Desalination is also being considered for the Eyre Peninsula.

Recommendation 5. The Commonwealth could consider increasing funding for research into:

- cost-effective, low-technology solutions for improving the quality of water supplies, with a focus on drinking water supplies
- cost-effective wastewater services to rural and remote communities, with an emphasis on safe reuse for appropriate purposes.

Evaluating the Costs and Benefits of Water Services

The cost and benefits of water conservation initiatives need to be determined in a holistic way, taking account of economic, social and environmental considerations. There is a need to develop 'triple bottom line' accounting methodologies that leads to transparency in the allocation and management of the water resource.

Promoting Water Conservation

Best Practice Water Conservation Principles

The Water Conservation Partnership Project (WCPP)⁵ has drafted a Framework of Best Practice Water Conservation Principles. The Framework includes a technique for Local Councils to implement the Principles. The Framework has a hierarchical structure based on:

- avoiding water use
- reducing water use
- recycling water
- disposing of water appropriately
- ensuring feedback and adaptive management.

Implementation of the Best Practice Principles will assist Councils that rely on the River Murray water resource (the focus of the project) or those who rely on water from other sources to ensure that they manage the resource in a consistent, environmentally responsible, manner.

Incentives

The WCPP has researched methodologies to encourage water conservation, and undertook an extensive literature review of incentives for water conservation, which include regulation and education. Their report, *Water - Waste Not Want Not*, is

⁵ An NHT supported project involving partnership between State Government, Local Government, Catchment Water Management Boards and other groups. Its focus is on the identification, piloting and demonstration of ways for reducing water use by councils and residential water users who depend on the River Murray, through multi-stakeholder participation and action.

relevant to the inquiry and includes national and international case studies relating to the effectiveness of demand management programs.⁶

Regulation

The development of appropriate standards, codes and guidelines to encourage the uptake of water efficient technology in rural (and urban) communities might be worth considering. The Building Code of Australia (BCA), for example, represents a potential mechanism for improving residential and commercial building water efficiency. The BCA was recently amended to include energy efficiency as a requirement of new residential and commercial development.

A water-efficient shower head working group, comprising representatives from Commonwealth, State and Territory government agencies and major water authorities, recently outlined a suggested approach for the wide-spread acceptance of water-efficient showers throughout Australia. The approach would include participation by all levels of government, National regulators (such as Standards Australia and the Australian Building Codes Board), and peak industry bodies to develop a coordinated approach to promote the desired change.

It is also understood that Environment Australia is considering investigating, as a priority, the potential for a mandatory water efficiency labelling scheme for appropriate water use devices. The South Australian Government supports investigation into water efficiency labelling, where this is undertaken in a collaborative manner with the States and Territories.

Recommendation 6. The Commonwealth could further assist the investigation and coordination of regulatory approaches, which would encourage the uptake of appropriate water conserving devices or practices in rural communities.

Education

Many consumers are willing to pay more for 'environment friendly' products and services. Environmental awareness provides impetus to demand management programs. Adequate resourcing for associated education is desirable. Accreditation and environmental awards that recognise those areas, groups or individuals who make conscious efforts to improve their water management for the benefit of the environment could be developed at the National or State level.

Case studies of demand management programs, both nationally and internationally, indicate significant impact of community awareness programs, when they are integrated into such programs.

⁶ The *Water Waste Not Want Not* report will be available for access at <http://www.environment.sa.gov.au/sustainability/incentive.html#report>

Recommendation 7. The Commonwealth could play a greater role in educating the community, professionals and trades in the areas of water conservation and efficient use of water. It could also encourage community participation, for example by:

- educating the community about ways to conserve water
- encouraging industry to develop and implement new technologies that conserve water.

Innovation

Over the past decade there has been significant interest in, and development of, schemes to treat and use non-traditional water resources in South Australia – principally stormwater runoff and treated wastewater - for horticultural and other pursuits. Interest largely originated from rural local government in the 1970s, but has now been embraced by both levels of government and the private sector in urban and rural areas.

The strong commitment of the South Australian Government to innovative use of alternative water resources is highlighted in *State Water Plan 2000*, where wastewater, stormwater and other non-traditional water resources are recognised as strategic resources and their management and use are emphasised as a focus for water resources planning.

Examples of innovative projects are provided in Table 2. The extent of innovation in the treatment, storage and use of non-traditional water supplies demonstrates an acceptance by the community, government and private sector of the potential value of non-traditional water resources. An outcome is that South Australia:

- has the highest percentage of municipal water recycling of any Australian state or territory
- is a leader in the use of stormwater for non-potable supplies
- is a world leader in aquifer storage and recovery (ASR) techniques.

The international importance of the ASR projects and trials in South Australia was recognised when in October 2001 the Director-General of UNESCO presented an inaugural international prize jointly to the Australian Research Group on Aquifer Storage and Recovery (within CSIRO) and the Department of Water, Land and Biodiversity Conservation (formerly Department for Water Resources), for their internationally recognised contributions to groundwater management in arid areas.

The South Australian Government has also initiated a two-year project called *Water-Proofing Adelaide* that will develop a long-term integrated water resources strategy for the Adelaide Metropolitan and adjacent rural areas. The project will assess methods to better manage the water resources available to the region – for example the technique of ASR, sewage mining, stormwater and wastewater treatment and recycling and desalination, and non-technological methods including education and demand management.

Table 2 - Innovative Projects in South Australia

Project	Description
Aquifer Storage and Recovery Projects	Large number of projects in South Australia. Perhaps the most notable current project is the Bolivar ASR Trial using reclaimed effluent. The successful outcome of the trial could lead to the sub-surface storage of up to about 10 GL of reclaimed wastewater for later reuse by market gardeners on the Northern Adelaide Plains.
Water treatment technology research and development	MIEX (magnetic-ion exchange) is a water treatment technology developed at the Australian Water Quality Centre, Bolivar. This technology improves water quality by the rapid removal of organic compounds. A prototype plant has been established at Mount Pleasant in the Adelaide Hills, and supplies the local community.
Environment Improvement Project	A \$240 million project to improve the quality of Adelaide's treated wastewater, which improves effluent reuse opportunities. As part of the project, a \$30 million treatment plant has been constructed at Bolivar, to provide high-grade recycled water to market gardeners in the Northern Adelaide Plains.
Spencer Gulf Reuse Strategy	Upgrades of waste water treatment plants (WWTPs) are planned for Port Pirie, Port Augusta and Whyalla to meet Environment Protection Authority requirements. The Government is investigating opportunities for reusing wastewater from WWTPs in the Upper Spencer Gulf towns.
Virginia Pipeline Project	A \$23 million project delivering high grade reclaimed water from the Bolivar WWTP to irrigators in the Northern Adelaide Plains (NAP). This required an investment of \$30 million by SA Water to treat the water before delivery to the Virginia scheme. The privately operated scheme involves supplying reclaimed water via a 70 km pipeline network to growers at a charge significantly lower than mains water.
Willunga Basin Pipeline	Reclaimed water from the Christies Beach wastewater treatment plant is piped to McLaren Vale and used on vineyards. With the full implementation of this private-sector funded scheme, there is the potential to double the area of irrigated vineyard in the region to 3,600 ha. This has an estimated farm gate value of \$120 million and higher value added benefits through processing and associated industries.
Membrane Filtration	A new wastewater treatment plant incorporating membrane filtration and ultraviolet disinfection being constructed for Victor Harbor. The plant will treat effluent to a very high standard that meets the South Australian Class A reclaimed water use guidelines.
Desalination	SA Water has built a sea-water desalination plant at Penneshaw, Kangaroo Island, to supplement local water resources. Desalination of groundwater occurs at Roxby Downs.
WILMA	South Australia is working towards introducing a modern, state-of-the-art Water Information Licensing Management Application (WILMA) to assist in managing the administration of water licences and facilitate trading of water allocations and salinity credits.
Irrigation Water Auditing/ Benchmarking	A very successful demonstration project to raise awareness by irrigators in the Angas Bremer region of their water use practices through annual irrigation reporting.
Clare Valley water supply	Use of spare capacity of the Morgan-Whyalla pipeline, whereby water is delivered during off-peak months for storage or use by growers. In addition, water industry (winery) waste and town waste is recycled.
Barossa pipeline scheme	A private scheme developed to use spare 'off-peak' capacity of SA Water's existing pipeline and pumping infrastructure from the River Murray. The water is sourced within SA's River Murray 'Cap' allowance.

Visionary Engineering Projects

Major capital works projects have sometimes been proposed to divert rivers to inland Australia, to provide water for rural development. Large-scale schemes that pipe water over large distances, are unlikely to prove economically viable. For example, the energy costs for piping water from the Ord to South Australia is estimated to exceed \$8 per kilolitre.

As well as the economic viability of such proposals other critical issues should be considered including the environmental impact on source and receiving environments, the economic impact on industries such as commercial fishing which depend on those sources, and the health implications from water transported in high temperature environments.

Notwithstanding the fact that many past large-scale water supply proposals do not stand up well in terms of their economic or environmental viability, it is important to look for opportunities for suitable economic, environmentally sustainable development projects. Innovative solutions, involving new technologies, such as desalination, and those promoting water conservation and recycling, might be appropriate in some localities. In the case of desalination, reducing costs of the technology, improvements in alternative energy technologies, and energy storage continues to improve the viability for supplying some remote areas.

APPENDIX 1 - Environmental Flows and the River Murray

Sustaining the resource base is critical to the attainment of a secure future. The waters of the River Murray, and elsewhere in the Murray-Darling Basin, are grossly over-allocated for irrigation, at the direct expense of river health. The Murray-Darling Basin Commission (MDBC) and the Ministerial Council are attempting to reach consensus on how to restore the health of the River Murray.

The Commission and the Ministerial Council have both received unequivocal scientific advice from the Expert Reference Panel (ERP), comprising eminent scientists from across Australia, that the major environmental damage to the River Murray is occurring below Wentworth NSW, and that the solution to this problem is more water for the Murray.

The ERP advises that, at the very least, an additional average annual flow in the Lower Murray of 750 GL per annum would provide a low to moderate likelihood of a healthy working river system. 1600 GL per annum of additional flow would provide a moderate likelihood of a healthy working river system, and 3300 GL would provide a high likelihood of a healthy working river system.

Outcomes from the Ministerial Council meeting of 30 March 2001

When the Ministerial Council met on 30 March 2001, it adopted a vision:

a healthy River Murray system, sustaining communities and preserving unique values

At the same meeting, the Council also adopted a set of 15 high-level objectives for the River Murray (Table A1). The objectives represent a significant step forward, and are now guiding the preparation of strategies and action plans to provide a healthy, working River Murray.

The Commission's Project Board on Environmental Flows and Water Quality Objectives has assembled a great deal of scientific, socio-economic and legal information on the problems and possible solutions for the River Murray. This information is beginning to reach the public through a community engagement process, which started in August 2002.

The CSIRO has been engaged to analyse the socio-economic impacts of the various options. They advise that the sources of the transfer of water from consumptive uses to environmental services would come initially from low value production in Victoria and NSW, at a cost which would be outweighed by salinity benefits in Adelaide and elsewhere.

Table A1 - High-level Objectives for the River Murray
(from Ministerial Meeting of 30 March 2001)

<p>River Health</p> <ol style="list-style-type: none"> 1. Protect and restore key habitat features in the river, riparian zone, floodplain and estuary to enhance ecological processes. 2. Protect and restore healthy riverine and estuarine environments and high value floodplain and wetlands of national and international importance 3. Prevent the extinction of native species from the riverine system. 4. Overcome barriers to the migration of native fish species.
<p>Environmental Flows</p> <ol style="list-style-type: none"> 5. Reinststate ecologically significant elements of the natural flow regime. 6. Keep the Murray mouth open to maintain navigation and fish passage and to enhance estuarine conditions in the Coorong. 7. Significantly improve connectivity between and within riverine, wetland, floodplain and estuarine environments.
<p>Water Quality</p> <ol style="list-style-type: none"> 8. Substantially improve water quality in the Murray system to a level that sustains ecological processes, environmental values and productive capacity. 9. Manage salinity to minimise impacts on ecological processes and productivity levels. 10. Manage nutrient levels to reduce the occurrence of blue-green algal blooms. 11. Minimise the impact of potential pollutants such as sediment and pesticides within riverine environments.
<p>Human dimensions</p> <ol style="list-style-type: none"> 12. Implement an adaptive approach to the management of the River Murray consistent with the ICM Policy Statement, monitoring ecological outcomes and reviewing operations in the light of new information. 13. Gather, evaluate and disseminate the community's living, scientific and intuitive knowledge to optimise environmental flow strategies. 14. Ensure participation of the entire community by recognising the cultural and historical relationship to the river, its landscape and its people and acknowledging the past to effect the future. 15. Recognise the importance of a healthy River Murray to the economic, social and cultural prosperity of communities along the length of the River.

Outcomes from the Ministerial Council meeting of 12 April 2002

The Murray-Darling Basin Ministerial Council meeting at Corowa on 12 April 2002:

- approved in principle, a range of measures costing \$157 million over 7 years covering structural and operational changes and investigations, to make the best use of the water currently available to the River Murray environment
- agreed to a Community Engagement Strategy to address the issue of environmental flows for the River Murray, commencing on 1 July 2002

- agreed that a comprehensive analysis of the economic, social and environmental impacts of providing environmental flows be undertaken
- indicated its desire to make a final decision on an environmental flow regime for the River Murray in October 2003.

These initiatives are in addition to a significant volume of work already in train to improve the environment of the River Murray.

The suite of actions agreed by Council will make the best use of the water currently available to the River Murray environment over the coming 7 years. The actions will result in improved floodplain health, fish management and management of the Murray Mouth, Coorong and Lower Lakes, and the establishment of water quality objectives for the River Murray. The actions will improve the health of the River Murray while not affecting the security of consumptive water uses. This approach underscores the Council's desire to focus management of the structures and resources of the River Murray to improve the environment while maintaining the social and economic benefits obtained from resource use.

Council considered the issue of recovery of water for environmental flows in the River Murray, specifically in terms of the trade-offs between the social and economic impacts of any recovery and the environmental gains. Existing information regarding the range of flow scenarios developed for the project to date will be provided to the community.

To improve understanding of the costs and benefits of recovering water for the environment, Council directed its executive arm, the Murray-Darling Basin Commission (MDBC), to identify and address key issues such as equity, property rights and water trade, through the development of a business case for the recovery of 350 GL, 750 GL and 1500 GL to the River Murray.

These amounts will be used as reference points for further analysis and community consultation. The analysis will identify local as well as system-wide environmental problems and benefits including the issues of the Murray Mouth, the Coorong, the Chowilla floodplain, the Gunbower/Perricoota and Barmah-Millewa forests, and to native fish such as the Murray cod. It will also identify costs of various options and strategies to manage the social and economic impacts of measures for improving the health of the River Murray.

Murray Darling Basin Water Trading Arrangements

The Ministerial Council of 12 April 2002 noted in particular the importance of establishing water trading arrangements for the efficient allocation of the scarce water resources of the Basin. It acknowledged that the effectiveness of such arrangements will depend significantly on clear definition of water property rights.

The Council also noted that on 5 April 2002 the Council of Australian Governments (CoAG) agreed that jurisdictions would report by September 2002 on opportunities and impediments to better define and implement water property rights regimes.

The Murray-Darling Basin Commission was asked to draw upon the work being conducted under the auspices of CoAG as it relates to its work on Basin water recovery matters. It was also asked to accelerate its own work on the development of water trading arrangements and related property rights in the Basin, including water trading rules that take full account of the environmental impacts of such trade.

Council recognised both the complexity of the environmental flows issue and the need for certainty in the communities relying on irrigated agriculture. To provide a dialogue between Council and communities, Council agreed to establish an intensive Community Engagement Strategy commencing with the release on 1 July 2002 of a document to inform this process. The Community Engagement Strategy is designed to facilitate the incorporation of community values, knowledge and aspirations for scientific and technical knowledge in developing, determining and negotiating options for the recovery of water for the environment. It will adopt both a river reach and a Basin-wide approach, and provide for input from local stakeholders, the general community in affected regions and the public interest nationally.

The Vision and Objectives for the River Murray adopted by Council in March 2001 (Table A1) will guide this further work.

APPENDIX 2 - Data Collection

The Commonwealth has legislated reporting requirements: for example, regular data collation is required for the Commonwealth's *State of the Environment* and for reporting on some water resources, such as the River Murray and the Great Artesian Basin under agreements to which the Commonwealth is a signatory. However, whilst rainfall data is collected nationally through the Commonwealth Bureau of Meteorology (BoM), stream-flow and groundwater data is collected and archived by States or water authorities.⁷

Water resources data are occasionally collated at a national level, such as through Review 75, Review 85 and the National Land and Water Audit 2000. Whilst reports have been developed at reasonably regular intervals, Commonwealth funding for these is *ad hoc*. Uncertainty in funding does not allow stations to be maintained to ascertain long-term trends such as may be needed to better understand the impact of climate change on regional Australia. Although the collection of rainfall data is largely the responsibility of the BoM, the South Australian Government has installed and operates a number of stations and provides this data free of charge to the BoM. However, if the South Australian Government wishes to retrieve the data from the BoM head office, a charge applies.

In the Far North of South Australia, the paucity of recording stations has resulted in underestimating standard design rainfall intensities, resulting in underestimation of flood risk and consequent damage to infrastructure, including Commonwealth funded roads and rail lines. Other infrastructure at risk includes above-ground pipelines associated with in-situ uranium mining, which has the potential to cause catastrophic failure and the pollution of surface water and major aquifers.

National Land and Water Audit

The National Land and Water Audit, funded from the Natural Heritage Trust, is required to enable the Minister for Agriculture, Fisheries and Forestry to meet his responsibility under the Natural Heritage Trust of Australia Act 1997. The Audit's task was to compile information on the surface and groundwater resources and assess the resource status in terms of sustainability of use.

While money was provided to the States to collate existing recorded and modelled data, the consideration of funding to extend and maintain the gauging networks was overlooked. As a result of this, assessment tended to concentrate on the large resources such as reservoirs and alluvial aquifers where detailed monitoring was available. Water extractions from fractured rock aquifers and farm dams, while representing a significant overall resource, are poorly monitored and, as a result, are generally not included in the analysis of most States. Given this, it is possible that the water use presented in the audit could have been significantly underestimated.

⁷ Some consistency is being achieved in data collection and archiving, through adoption of the same software system (HYDSYS). The Bureau of Meteorology web site has links to sources of flow data.

In South Australia, because fractured rock aquifers and farm dams provide the only irrigation water in much of the State, intensification of irrigation development and resultant impact on stream flow has been identified as a major issue. Often these resources provide the only available domestic supply to rural communities, yet because of their size, increasing irrigation demand can rapidly threaten their sustainability. Detailed monitoring required to quantify such problems has not been attempted in many areas of the State, due to funding limitations.

While future audits may require accurate information on use and sustainability to be provided, the ability of the States to comply will be determined by the monitoring networks that they are able to maintain. If these networks are not expanded to include the smaller more diverse resources, future water supplies for many rural communities may become threatened without any early warning signs to prompt proactive intervention.

Flood Warning Issues

Proposed cost sharing arrangements for flood forecasting and flood warning are weighted toward State and Local government.

State Government currently maintains a number of flood-warning sites for the BoM through its telemetry interface and BoM accesses the stations' hydrometric data using South Australian Government equipment, the maintenance of which is based on informal arrangements.

The South Australian Government through the Department of Water, Land and Biodiversity Conservation continues to provide ongoing support to BoM in assisting in flood warning monitoring at its established sites. This assistance includes:

- BoM utilising DWLBC rainfall and river stage water monitoring infrastructure and equipment, and downloading electronic data collected at DWLBC
- accessing to stage-discharge relationships for streams.

Where it is agreed that a BoM service could be more effectively provided by a State or Local government, such arrangements could be formally ratified.

APPENDIX 3 - Rural Community Water Services

Overview

The majority of the State's population receives reticulated water from SA Water's infrastructure. Nevertheless most of the area of the State is not reticulated, and there are a large number of small remote communities without access to good quality, reticulated water supplies.

Woomera, in the north of the State, is supplied by a pipeline from the River Murray at Port Augusta, with the scheme being under the control and at the expense of the Commonwealth. Spur lines serve Pimba, Mt Gunson, and Hesso (Commonwealth Department of Defence). Water supplies to Aboriginal communities are provided by the Commonwealth Government. Council supplies exist at Roxby Downs and Coober Pedy. Subsidies are given to some local communities outside council areas in the far north of South Australia through the Outback Areas Development Trust. In the case of Roxby Downs, the water is desalinated and supplied by Western Mining Corporation.

Some private schemes exist in parts of the Adelaide Hills and other areas of the State, including Hillbank, Skye, Clayton, Leigh Creek, Hindmarsh Island, Wirrina, Younghusband, Wellington East marina, Narrung, Sunnyside Estate, Butler Rise, One Tree Hill, Andamooka, Blinman, Moomba gas fields, William Creek, Innamincka, Arkaroola, Cook (Australian National), Tarcoola (Australian National), Copley, Lyndhurst, Glendambo, Mintabie.

In addition, water is distributed to areas near SA Water main trunk supply lines via 'neighbours agreements' with SA Water. Schemes such as this operate at Black Point, Fisherman's Bay, Weroona Island, County Ash, Iron Baron, Mangalo, and Balgowan (Yorke Peninsula Council).

The cost of providing rural water supplies is generally much higher than metropolitan areas, due to diseconomies of scale, remoteness, poor water quality sources (particularly salinity) and the high length of mains per service in rural areas. These problems are particularly apparent in the northern part of the state, where average rainfalls are very low and unreliable, and evaporation very high. The median community size is 1000 persons, which limits available expertise in supplying technical water services.

Water supplied by SA Water is charged for at the State-wide uniform charge for water, except in a number of towns, particularly along the Barrier Highway where the water system was taken over by Australian National. Government rural water supplies are subsidised by Community Service Obligations. Water supply costs at Roxby Downs are determined by the Roxby Downs Indenture Act. Council and private suppliers determine their own charging structure, generally on a cost-recovery basis.

Water volume limitations exist in some areas, such as Eyre Peninsula, where the storage volume in the aquifers is dependent on relatively recent rainfall (over about the last ten years). According to Australian Bureau of Statistics, about 80% of non-

metropolitan households have rainwater tanks. In some areas demand management programs (at Streaky Bay running over a period of about twenty years, with periodic reinforcement) have been reasonably effective in maintaining a balance between demand and the sustainable yield. There is an interesting irony in South Australia, in that the largest per capita residential consumers of water are at Roxby Downs, in arid South Australia, which is a high income area with a high quality desalinated water supply.

Most wastewater services in rural communities are provided by SA Water or Local Councils via Septic Tank Effluent Drainage Schemes (STEDS). In some areas, wastewater is treated and disposed, or reused, on-site by processes such as septic tank systems and individual household aerobic treatment units.

The State Government provides regular funding assistance to Local Government to subsidise the capital costs of establishing STEDS schemes. To encourage the reuse of reclaimed water and public health and the environment, the Department for Human Services (DHS) and EPA have produced guidelines for the use of reclaimed water in South Australia.

Services Provided by SA Water

SA Water infrastructure connects to South Australia's largest population centres and many smaller communities⁸. Extensive development of water supply infrastructure in the 1960s and 1970s assumed higher rates of growth than have occurred. For this reason, and due to the ability to draw much of its supply from the River Murray, in most cases, the rural infrastructure in place is adequate to maintain supplies to existing customers.

A notable exception has been the Eyre Peninsula, which is reliant on groundwater resources. (Mount Gambier, in the South East of South Australia, is the only other major community that is reliant on reticulated groundwater supplies).

The Eyre Peninsula groundwater resources have been declining, which has necessitated a detailed review of sources for the future. An extensive Master Plan study for the Eyre Peninsula is nearing completion. This has shown that population is likely to remain relatively static in the foreseeable future, but that demand increases may occur due to industrial or horticultural development subject to potential uses being commercially viable at the true cost of water. Possibly the greatest impact, however, is the expected continual decline in the available water resource due to below average recharge of the groundwater basins.

Demand management has potential benefits in the reduction of necessary investment to meet future demand, and the potential to limit the demand on resources. It is one strategy to be examined as part of SA Water's development of detailed Master Plans for rural and metropolitan areas.

⁸ In some areas water is imported via non-State owned branch mains that access State-owned trunk lines

Trends of increases in the salinity, turbidity and colour of River Murray water have potential impacts for most of SA Water's urban and rural customers.

SA Water's Charter includes the objective to operate water and waste water services in a way that reduces the environmental impacts. SA Water is reducing the impact of its wastewater treatment plant operations on the environment through the implementation of Environment Improvement Programs (EIPs) developed in conjunction with the Environment Protection Agency.

SA Water has EIPs for 13 of its 19 country wastewater treatment plants. EIPs for plants discharging to the marine environment focus on reducing the quantity of nitrogen discharged, through the adoption of Biological Nutrient Reduction (BNR) technologies in plant upgrades and reuse where economic and environmentally sustainable. EIPs for plants discharging to inland waters focus on reducing the quantity of phosphorus through the adoption of BNR and/or re-use.

SA Water has a long-term goal of achieving 50 percent reuse of wastewater in South Australia. In the short term, SA Water is aiming for 24 percent reuse from its country wastewater treatment plants. Developments to date in this regard include:

- Improving wastewater for reuse from Bolivar to 'Class A' grade, in accordance with the 'South Australian Reclaimed Water Guidelines'. Reclaimed water is being supplied for horticulture in the Virginia area.
- Distribution of treated wastewater from the Christies Beach treatment plant for vineyard irrigation in the McLaren Vale area.
- Partnership with City of Port Lincoln in the reuse of wastewater from the Port Lincoln Wastewater Treatment Plant, which has attracted National Heritage Trust (NHT) funding.
- Negotiation with landowners to progress the design of reuse schemes for the Bird-in-Hand, Millicent and Angaston Wastewater Treatment Plants.
- Evaluation of options for effluent reuse from the Whyalla Wastewater Treatment Plant.