

Confronting Water Scarcity: Water Futures for South Australia

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Introduction

In 2004 I had the pleasure of living in Adelaide as Thinker in Residence, and was able to talk with many people about water, always a matter of great interest to South Australians. In my Thinker's report to the people of Adelaide I said

“The stark situation is that Adelaide is facing a squeeze on its available water, and that it would be prudent for the state to be considering how it will meet this demand, especially if additional water is either not available from the River Murray, or more likely is excessively saline for domestic use. Contingency planning should be underway for a situation when the River Murray cannot sustain the city.”

This situation has now arisen. The MDBC Drought Contingency report last month showed salinity levels at Morgan had already almost doubled. While keeping them within drinking water levels is a management priority that guides releases from upstream storages, there is little water available and SA is not getting its normal MDB entitlement due to lack of water.

Let me commend the MDBC for its drought reports available on its web site. But unless there is significant rain in the upper catchments there is every likelihood that salinity levels will make water in the Murray unsuitable for drinking early next year, and the rising salinity is likely to lead to fish kills and other water quality problems in the Lower River and Lakes.

This is a wicked problem for our society and our politicians. Do we use available water to try to keep permanent plantings in irrigation areas alive and hope we get better rains to get us through next year, or do we hold water back to keep towns and Adelaide going next year?

We face a situation with much less water available, and everyone believes they have a priority for its use. Riverland irrigators recently called on the Federal Government to take water from upstream irrigators to keep Riverland plantings alive. Melbourne and Canberra are both planning to take MDB water to augment urban supplies. Urban users also expect Snowy Hydro to maintain adequate water to provide peak electricity supply. Annual irrigators like rice and cotton growers have not had any water for some time.

Southern Australia is drying out. The demands on our dwindling water resources are escalating. Everyone believes their use of water should be the priority. The environment has been largely sacrificed with the Coorong rapidly becoming like the Dead Sea.

We are facing a crisis. There will be a horrible shakeout in rural Australia and our cities are going to have to lift their games in water planning.

The Climate Challenge

I think most Australians know something is changing with our weather. We can measure the increased CO₂ in the atmosphere, and we know it is due to human activities. We can observe that since 1950 Australian average temperatures have increased 0.9° C, and this change is predicted by the greenhouse gas effects. The best estimate of annual warming over Australia by 2030 relative to 1990 is a further increase of about 1° C (CSIRO, 2007). Later in this century, the warming is projected to rise by around 1.8° C for the best-case scenario and around 3.4° C for a high emissions case, with a 20 to 50% chance of temperature increases exceeding 4° C in inland areas, such as the Murray Darling Basin.

Further evidence of warming is provided by the snow record in southeast Australia where the snow depth at the start of October has declined 40 per cent in the past 40 years. This warming will lead to more evaporation from storages, increased transpiration of water by plants and an increased frequency of mega-bushfires.

Scientists have no doubt that that increased greenhouse gases in the atmosphere are influencing rainfall patterns. CSIRO scientists have estimated that around half the decline in rainfall in Sth West WA is due to greenhouse gas. Predictions are of a 5-15% decrease in rainfall by 2070.

It seems we are facing a future with declining and more erratic rainfall. Winter and spring rainfall will drop but there may be increases in summer thunderstorm activity.

A small reduction in rainfall is accompanied by a larger reduction in runoff. We can see the reduction experienced in Perth since the 1970's and can now see the same reduction for Sydney's storages since around 1990.

When we come to the MDB, the source of much of Adelaide's water, the same picture emerges. This year the winter –spring rains have again failed. September inflows were 210 GL compared to a long-term average of 1610 GL. Monthly inflows have now been below average for the last 24 months. There is about half the water in the MDB storages (at 23% of capacity) now that at this time in 2006.

One of the most important tributaries to the MDB is the Goulburn river, which in 2005-6 was at 58% of the long-term flow, following a year when it was 68% of long-term flow. Over the last 10 years it has averaged 62% of the long-term flow. As river levels fall, saline groundwater flows into the Murray.

I think we are seeing the double impact of a serious drought and climate change. But there is no guarantee our river flows are stable and they may continue to decline as has been the case in Perth. Hoping for rain seems to have been the main strategy to date, but as a community we now need to get cracking so as to cope with the water deficit that is emerging in Southeastern Australia. We must move from denial to acceptance, since the time is short and the risks and costs escalate as we dither.

A Blueprint for Addressing Water Scarcity

The good news is we have a blueprint for facing water scarcity in the National Water Initiative that has been agreed by the Premiers and Prime Minister. This blueprint is as good as it gets, and will let us cope if we could only get on and implement it. They give us the best possible framework for coping with water scarcity, but we have been slow to implement them and this tardiness is putting communities at risk.

- Understand how much water we have and how we use it
- Determine how much water we can take and still have healthy rivers and secure groundwater
- Give users clear entitlement to water.
- Allow users to trade their entitlements
- Restore over allocated systems
- Effective water planning

South Australia has made reasonable progress in implementing a number of its National Water Initiative commitments. South Australia has completed water plans for priority systems and has tradeable water access entitlements. The National Water Commission identified a number of areas requiring further attention in its Biennial Assessment of progress.

- Dealing with over allocation
- Better integrating the management of surface and groundwater resources and in relation to land use changes that intercept significant amounts of water
- Improving water resource accounting and measurement to ensure that water is extracted, diverted, stored, traded and used in accordance with the conditions set out by water plans and defined in water access entitlements
- Enhancing the compatibility of individual southern Murray-Darling Basin registers to support timely and low cost water trading transactions across irrigation area boundaries and state borders
- Establishing arrangements for recovering costs of water planning and management.
- Stronger pricing oversight arrangements that are presently among the weakest in Australia.

Who Can We Blame?

I know South Australians like to blame upstream irrigators for the problems they face. But the reality is there has been very little water for cotton or rice in the last couple of years.

Cubbie station can hardly be blamed when they have not taken water. Indeed, many irrigators in all States are watching their permanent plantings die because of insufficient water.

While politicians like to blame other levels of Government, the reality is that our politicians reflect what we as a community are telling them. We are all responsible for the mess we find ourselves in. As a society we have been in denial about climate change for the last decade and we have chosen not to do anything much about it. We now live with the consequences and had better get used to it since we can't turn back the clock. The present squabbles about carbon constraints will influence our climate 20-30 years out if we, as the human race, have the capacity to do anything. In the meantime we had better adapt to the world we have created.

Securing Adelaide's Water Supply

The Needs of the City

In 2004-5 Adelaide used 164 GL of water or about 406 litres per person per day, amongst the highest in the country. Each person used 273 litres of water each day in their homes, and a further 133 litres for commercial and open space uses. With much tighter water restrictions, and now some serious effort by SA Water to encourage water savings this will have reduced. Again, this was one of my 2004 recommendations.

No Government yet seems to have been able to see the connection with rampant population growth and increasing water deficits. In 2005 the State's population was 1.542 million, with 73% living in Adelaide. The South Australian Strategic Plan seeks to increase this to 1.64 million by 2014 and 2 million by 2050.

From a water planning perspective it is likely the bulk of these additional people will seek water from the Adelaide system, so we need to consider the likely needs of at least 1.65 million people. If people continue to use water at the rate they did in 2005-6, at 406 litres per person per day, this will require some 245 GL of water/yr.

In 2005-6, an average rainfall year, about half the water came from the hills catchments and around half from the Murray River. In a wet year, more can be sourced from the Hills catchments, but in dry periods some 70% may come from the Murray. Adelaide has the capacity to store around 200 GL in its storages, and at present they are around 87% of capacity, around a years supply.

The Hills Catchments

CSIRO have now released their assessment of water availability in the Eastern Mount Lofty Ranges, which perhaps gives us some idea of what is happening on the Western slopes. If the recent climate continues they predict a reduction in surface water from 120 GL to 92 GL/yr and groundwater recharge would drop from 64 GL to 50 GL/yr. If the increase in farm dams and plantation forestry is considered, a further 3% reduction is expected.

Following my report in 2004 the Government did proclaim the Mt Lofty catchments and are presumably now stopping further bores taking groundwater, farm dams evaporating water and forestry plantations taking water. However all of these interests will be lobbying hard to try and be allowed to keep doing what they have traditionally done. While the EPA has been doing valiant work trying to control pollution from tourism and hobby farms and vineyards, the actual water planning has been quite leisurely. A series of discussion papers have been issued, but no plan is expected until next year. Adelaide needs to assert its demand that these catchments be managed to provide secure high quality water, and not further sacrifice these catchments to other commercial interests.

The Murray River

The Murray will continue to be an important source of water for Adelaide, but there will be periods when it is not usable. Increasing the size of storages will mean water can be pumped when the river is of acceptable quality and this will help tide the city over dry times. Most cities in Australia store between 3-6 year's supply of water to cope with variability. Adelaide has only stored around a year's supply because of the past reliability of the Murray. Future uncertainty about the reliability of the Murray does support the need to store more water.

Water Planning in Uncertain Times

Given the reduction in water availability from both the Hills catchments and from the Murray R, what is the best way forward into the future? Coping with uncertainty suggests four things.

- Reduce our demands on water to secure supply
- Have a variety of water sources, at least some of which are independent of rainfall.
- Identify the next three or four water augmentations and do preliminary planning obtain necessary approvals and identify trigger points when construction must start
- Protect possible future water sources so that they will be available when needed

The Prime Minister has said that long term rationing of water is as unacceptable as rationing electricity. But in our variable climate we have always used water restrictions to reduce demand during drought. The alternative is a greater capacity to supply water at considerably greater cost. If urban communities want a higher level of water security, they will need to become more accepting of recycling water into our drinking supply, and the use of desalination, as well as paying more. We have used all the cheap options for meeting our water needs – the next augmentations will all cost more.

Adelaide has the following options for augmenting its water supply

- Purchase water from upstream irrigators
- Desalination
- Recycling
- Groundwater

- Urban Stormwater

SA Water has already been purchasing water from upstream irrigators in the Lower Murray. This probably remains an important option, but there is increasing competition for river water. Both Melbourne and Canberra are seeking additional supplies from the MDB. The needs of water for generating peak load electricity will remain a priority. The environmental needs of the river itself are obvious at this end of the river and many irrigators will want to assure water supplies to protect their enterprises and their communities. The other aspect of pumping water from the Murray is the greenhouse gas contribution of the pumping. In a dry year such as 2002-3 some 444000 tonnes of CO₂ equivalent were produced compared to a more normal year like 2005-6 where 265000 tonnes were released.

A number of cities have turned to the sea to augment their water supply. The Perth desalination plant is operating, and the Gold Coast and Sydney plants are under construction, and planning is underway for one in Melbourne and a second plant in Perth. The Premier has announced planning for a 50 GL/yr desalination plant and needs to identify an appropriate site where good quality water can be obtained and where the saline discharge water can be adequately mixed. Clearly there is an opportunity here for the oceanographic and coastal skills at Flinders to help solve this issue. The other issue is energy use and the greenhouse gas implications, and most plants are committing to use green energy or to be carbon neutral.

Recycling is another possibility. We can treat wastewater to a standard to return to drinking water supplies, and Brisbane is proceeding down this path. This does require holding the water for a considerable time in storages to enable natural purification processes and to allow for dilution. An inquiry in Canberra found this was a feasible option for Canberra, and that micro contaminants were not likely to be a problem. Canberra has however now announced that it is not proceeding directly down this route, but is building a pilot plant. Another recycling option is to deliver recycled water to homes via a “third” pipe such as at Mawson Lakes. This water can be used for outdoor garden use and for toilet flushing, and is a substitute source of water. These uses do not require high quality drinking water. Several Australian cities have boutique developments of this nature to demonstrate the technology, which has been quite successful. It has however, not been widely adopted in all new developments. South Australia has been a leader in using recycled water for irrigation. However, it may be necessary to review this strategy and use reclaimed water to relieve the pressure on the city’s drinking water supply.

The Adelaide plains have now been proclaimed as a groundwater management area and this stops further extraction of groundwater. However, the groundwater resources have been over allocated and the present entitlements are seen as beyond the sustainable levels of extraction. This means levels will drop and sea-water will be drawn into the aquifers near the coast. The Australian Water Resources 2005 released by the National Water Commission attempted to develop a water balance for the Adelaide area and was unable to find information on the groundwater volumes available, the sustainable yield and even the actual amounts being extracted. It did report a slow decline in groundwater levels over the last 50 years probably as a result of urbanization of recharge areas and over extraction. At

this stage the over use of the North Adelaide aquifers appears to be leading to localized cones of depression in the groundwater levels. There are over 1000 entitlements to extract water with a total volume of 26,735 ML, whereas the sustainable yield is thought to be 18,900 ML. The NRM Board does believe use itself is within sustainable limits but the Government has committed under the 1994 CoAG water reforms and again under the NWI to return over allocated systems to sustainable levels of extraction. Hopefully they will achieve this in the Water Allocation Plan under development, and South Australians should insist that they do, despite the economic interests wanting to mine the resource in a non-sustainable way,

South Australia would have more credibility with its complaints about upstream States having over allocated water if it demonstrated any preparedness to address over allocation of this important groundwater resource.

Urban runoff is commonly seen as an attractive water source. The difficulty is in storing it from wet periods until it is needed in dry times. Adelaide has led the country with aquifer storage of stormwater and subsequent recovery for various uses.

The Premier has announced that investigations into both increasing the size of storages in Mt Lofty and developing a desalination plant in response to this risk.

Actions to Secure Adelaide's Water

I support the Governments announced plans to increase the size of Mt Lofty storages, allowing more water to be pumped from the Murray when its quality is acceptable, and allowing the city to carry over water for the low flow periods when it is saline. This is a sensible medium term strategy, but will not help in the current extreme circumstances.

I also support the proposed desalination plant. I am aware of the negative aspects in terms of mixing in the gulf and the greenhouse gas aspects, but it at least provides a source of water that is independent of rainfall. This could be a critical water source for the city if current conditions continue and I would urge that this project be fast tracked.

I also believe South Australia needs to put more resources and possibly fast track its water planning in the Hills catchments and on the Adelaide Plains. Both have now been proclaimed, so there is a moratorium on further extraction, but more effort is needed to understand the resource and be aware of the sustainable levels of extraction from each. Each source needs to be protected from activities that take water and from contamination.

South Australia has long been a supported of improved management of the MDB. The appointment of an Independent Commissioner to the MDBC was I believe a great step and a help to the Commission. I wish other jurisdictions had followed this leadership, and we may not have had the need for a Federal takeover of the Basin. However, there is much to be done under the Prime Ministers Plan for Water Security, and South Australia needs to take a leadership role to try and make this work. Given your future dependence on the water market, I suggest you join forces with an upstream State and have a common water registry and transfer system with one or preferably both States.

South Australia is proud of its efforts in recycling, but this needs to change. Supplying recycled water for market gardens is useful, but the critical need now is to take pressure off drinking water supplies. Some of your recycling is taking pressure off groundwater, but should be accompanied by a clawback in entitlements. You may not be ready to recycle directly back into drinking water, but some other communities have already moved in this direction. Using reclaimed water for open space and commercial uses is an important first step, but does involve investment in duplicating pipe systems to deliver the water.

Adelaide has already pioneered the use of storing stormwater in aquifers for later use and this program could be expanded. This should be done in conjunction with tight controls and strong management of the entire groundwater resource.

Adelaide has been slower than most other cities to embark on demand management and have managed to reduce per capita usage from the incredible 500 litres/person /day to 410 litres in 2004-5. There has been a good uptake of rebates for installing rainwater tanks and a range of other rebates are now available to householders installing water efficient appliances. While South Australians find themselves in the unusual situation of having water restrictions, SA Qld has now moved to level 6 restrictions requiring water to be trucked in for refilling pools and there will be drastic cuts in commercial users and other large users. This is needed even though per capita usage has dropped to 129 litres/ person/ day down from an average of 296 in May 2005.

It is apparent that the Waterproofing Adelaide, completed only a couple of years ago did not achieve its aim, and further augmentations of supply have been needed following the dramatic change in availability of water from the Murray I believe water planning in uncertain times needs to be more pro active and sophisticated and that Adelaide should identify its next 3 or 4 augmentations and should proceed with planning, design and all necessary approvals, and for each identify a trigger point when construction must start given the construction lead times and the forecasts of water availability.

Futures for the Murray-Darling Basin

Not only is Adelaide's future tied to the future of the MDB, but so are many rural communities dependent on the river for domestic water supply and for water for irrigation.

We now face a horrible readjustment in rural Australia, similar to that faced in Goyders time where 3-4 wet years led to unrealistic expectations; now we have had 40 years of unusually wet conditions in the MDB from 1950-1990, and the last 15 years the Basin has been drying. Our refusal to recognize this meant we have allowed the major storages to empty, and they will not refill again without a run of wet years.

The lack of water is already having a devastating impact on irrigators and their communities as we have already had the death of some permanent plantings in the Basin, and more can be expected from both lack of water and from salinisation of water.

The Federal Government has committed \$10 billion to improved management of the MDB. This gives us an incredible opportunity to build a foundation for wealth creation, but it gives special interests the chance to make sure we squander this money without giving us the outcomes taxpayers expect.

I believe Australians want to see a healthy MDB that provides good quality for water for towns along the river including Adelaide. I believe they expect to see the Coorong and Lower Lakes as healthy and productive ecosystems – not the Australian version of the Dead Sea. I believe they want to see an irrigation sector that produces food and fibre to meet our needs and to create wealth for rural communities. I believe they want to see an irrigation sector that can create enough wealth to pay its way without expecting \$10 billion handouts every so often because they will not pay to maintain infrastructure.

With the increasing competition for water and the climate change we are experiencing I believe irrigators will have to get used to half the water they have been accustomed to last century. Water will in future be less reliable than in the past. We will have a better idea of this once the CSIRO yields study is complete later in the year, but we still have to address the river health problem and the declining security of supply which puts at risk investments in irrigation.

Irrigation landscapes will change. I expect a reduction in the area of permanent plantings and perhaps more emphasis on annual crops that can be planted once water availability for the season is known. Irrigation properties may become larger to cope with a mix of perennial and annual plants and more opportunistic irrigation. There will be an overall contraction in the area irrigated, leading to issues of stranded assets and increasing operating costs to those remaining.

There will be ongoing downward pressure on prices, especially in export markets, and with the value of water increasing due to scarcity and pressures for cost-reflective pricing there will be opportunities to leave farming. There will be strong pressures to improve water use efficiency, and in some enterprises such as dairy there is room for this, whereas many efficiency improvements have already been made in rice and cotton enterprises. We may see dairy farms leave irrigation areas and become purchasers of fodder from irrigators and other sources. New irrigation technologies like sub surface tape may see crops move from heavier to lighter soils.

A critical issue for irrigation is whether to spend funds refurbishing old irrigation districts, where properties may be too small, and irrigation layouts inappropriate for current irrigation technologies, or to allow water to trade out and develop new irrigation enterprises on Greenfield sites. This has been happening over the last decade, and will probably continue. This will lead to the closure of some parts of existing irrigation systems.

This is an important issue for the Federal Government who have some \$3 billion to purchase water entitlements and nearly \$6 billion to refurbish irrigation systems. It is important to enter the market and purchase the water before developing infrastructure, or there is every chance expensive pipes and channels will go to areas where irrigation may be contracting. Refurbishing last century's infrastructure may be silly when whole regions

must be reconfigured with bigger farms and different irrigation layouts. What is the relative role for publicly provided infrastructure and that of the landholder?

We have a tremendous opportunity to build an irrigation sector that can double the wealth obtained from around half the water.

Do we have the foresight and the political systems that will let us achieve this?

Concluding Comments

Much of Sth Eastern Australia is drying out and is now in serious water deficit. It is no longer prudent to believe this is a drought that is about to break. There is every likelihood that we are seeing real climate change and this must be a driver to let us start managing our water resources as though they were a scarce and valuable resource upon which we all depend.

We have the blueprint with the National Water Initiative. We now have funds and a new bureaucratic structure with the Prime Ministers Plan for Water Security. The challenge now is to make this work in an era of increasing pressures on a diminishing resource, when every interest believes they are special and should have priority use of what water is available, and when our over extraction has reduced the resilience of our natural ecosystems to sustain our society. South Australians have the opportunity to give a lead in this regard, and I believe your economic survival depends upon you doing this. Your own water planning needs to be internationally best practice. It is not at this level now.

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