

# Water Challenges of the 21<sup>st</sup> Century

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### Introduction

Australia is facing some serious water challenges, and business as usual is no longer an option. Many Australians, both urban and rural, are concerned they will not have the water they believe they need to support their lifestyles or their businesses. We have increasing demands for water, and yet we seem to have a shrinking amount of water available to us.

I don't believe there is much doubt that Australians not only want to see healthy rivers but they expect water to be available to support their urban lifestyles and for agriculture to supply the food, fibre and the jobs they expect. Water management in the 21<sup>st</sup> century has to address these conflicting and difficult demands. There is no doubt that all who want water must ensure it is used efficiently; it is necessary to measure, manage and plan water much better than we did last century.

I start with three observations on the legacy we have to work with:

- Australians have caused measurable changes in the health of many of our rivers causing impacts on fish, waterbirds, wetlands and floodplains, as well as on estuaries and coastal waters.
- The health of a river is directly driven by the health of the catchment, and the land uses in the catchment determine the health of the rivers.
- We cannot return these impacted systems to a "pristine" or pre-European state, but we need to understand that if we push any ecological system too far it will change to a systems that may be much less desirable. Dryland salinity, algal blooms on the Darling and Murray and the loss of thousands of river redgums along the Lower Murray are examples of where I believe we have pushed our systems too far and lost things many of us value.

### The Pressures on our Water Resources

There are increasing demands for water from the burgeoning growth of urban areas, from agriculture where water is wealth and the recognition of Governments that we have over-allocated many of our surface and groundwater systems and that they must be returned to sustainable levels of extraction.

Climate change is now real and unavoidable. Had we heeded the early warnings we may have slowed or avoided the present problem, but we didn't, and so now we must learn to adapt. It seems certain that our rainfall will be more variable, and many areas that we now farm will have

less rainfall. It seems that some Northern areas may have cyclones of increased intensity and frequency, but we cannot yet be sure.

The challenges our society faces in terms of the climate change issue are:

- Rising carbon dioxide is driving the climate change, and if we seek to slow the increase we need to reduce use of fossil fuel. This appears to be beyond our civilization, but we should expect some form of carbon tax that will increase fuel prices.
- Many presently marginal farming areas will become impossible to farm. Do we have the capacity to get people off these lands or will we subsidize them to stay maximizing their misery and the land degradation, and preventing viable operators getting access to more land? Drought relief is the cutting edge of this problem, and one political parties continue to refuse to address.

### **Other Drivers of our Future**

There are two other elements that must now enter into our thinking.

- Fuel prices will continue to increase – let's start thinking of \$3.00/litre – what does this do to the economics of tractor use on farms, the transport of goods and the opportunities for biofuels?
- The threat of global pandemics will increase. Grinding poverty in undeveloped countries mean families live in close contact to various domestic animals, and will avoid killing animals when a risk occurs. The implication could be a sudden shut down in global trade. There is therefore a strategic imperative for Australia to be self sufficient in as many of its needs should start to become more important than doctrinaire positions about global free trade.

We are entering a tough new world, and we have little in our past experience to help us make smart decisions. Communities are frightened of change and will seek to protect the status quo if they feel alternatives may be worse for them. Politicians want bold visionary projects to show they care and are doing something, but many of the projects that come to the surface are just silly in economic, social and environmental terms.

### **The River Health Agenda**

We have developed tools to measure river health over the last 10 years, and the National Land and Water Resources Audit (Anon, 2002) provided a worlds first in terms of a national snapshot of river health.

Some 14,606 river reaches throughout the agricultural regions were examined and reported an aquatic biota index (invertebrates) and a physical environment index. Each was reported separately in four bands (un-impacted reference condition and three bands of increasing level of impairment. On the biological assessment, one third of the river length assessed (21,909 km) was to some degree impaired, meaning it has lost between 20% and 100% on the invertebrates that would have been expected to be found in similar un-impacted reaches. Almost one-

quarter of these rivers have lost at least 20% of the different kinds of aquatic invertebrates that would be expected to occur under natural conditions.

The environmental assessment considered catchment disturbance, flow disturbance, nutrients/suspended solids and aquatic habitat, indicated that 85% of reaches had been modified, largely by catchment activity. Nutrients and suspended solids are higher than natural in some 90% of river reaches. More than 50% of river reaches had impaired habitat, largely due to loss of riparian vegetation.

We do know what is needed for a healthy river (Allan, 2004) and many catchment bodies are using NHT and NAP funds to seek to protect \ and restore rivers.

Governments have now committed to two new programs to improve river health. The National Water Initiative requires Governments to identify surface and groundwater systems of high conservation value, and manage these systems to protect and enhance those values. Some of these systems have already been identified and are designated in various ways, but there has been no national systematic attempt to establish a comprehensive national system of aquatic reserves. A number of important wetlands have been designated under the RAMSAR convention.

### **A Healthy River**

- **Intact riparian vegetation communities - Shade (temp), leaf litter, filtering**
- **Flow patterns that provide appropriate wetting to maintain particular parts of the ecosystem – maybe periodic flooding so floodplains & wetlands connect to river**
- **No blockages to fish migration**
- **Control pollution - sediment, nutrients, salt & chemicals**
- **Control exotics**

There are four clear reasons why we need to maintain biodiversity in our aquatic ecosystems.

- to meet our international biodiversity obligations (Australia signed the International Convention on Biological diversity of 1992 in June 1993),
- to provide benchmark reference areas so we can assess how much more managed rivers have departed from the natural.
- to provide “seeding” sources to help re-colonise downstream areas that have been damaged,
- the various aquatic species are of value in themselves, and the communities provide essential and often irreplaceable ecosystem services

However, identifying these high value conservation systems is the easy part in comparison to managing them, especially when the catchments are in private ownership, and landholders have development aspirations. Some State water plans are already identifying such systems and restricting further development of water resources, which is an essential precondition to managing them. Governments still need to find appropriate ways of managing these systems, which might include payments to landholders to ensure catchment management is appropriate.

The Queensland Wild Rivers Legislation provides an excellent framework for addressing this issue, and meets one of the commitments made by the Premier when he signed the National

Water Initiative. I understand the Qld Government is considering amending this legislation, and I know your organization has been calling for a Moratorium on its use.

Protecting these remaining rivers will reduce development opportunities, especially in regard to new irrigation developments (Cullen, 2003). In my view if these areas had great potential for irrigation, they would have already been developed. The Wild Rivers designation should not have great impacts on pastoral activities, but I am not familiar with the fine print of the amendments under consideration. However, there are many voters who will be very angry if the Government walks away or weakens this fine initiative.

### **Government Commitments to Return Over Allocated Systems to Sustainable Levels of Extraction**

While some rural interest groups like to suggest that sustainability refers to economic and social elements, this is not the wording of the NWI. This means that before any water plan can be regarded as NWI compliant it will need to be demonstrated that the plan has identified the environmentally sustainable levels of extraction, and commits to a pathway to ensure this is reached, with substantial progress being made by 2010.

Substantial progress to me means returning water to the river. It is not enough to do studies, or decide that it's hard to achieve. The commitment is clear and seeking to redefine these words is not an option.

This provides us with two major challenges, once scientific and one for the community

- Defining the sustainable level of extraction in a variable climate
- Deciding our communities approach to risking a system collapse if we get it wrong

Identifying the environmentally sustainable levels of extraction is not a simple matter. Rivers include the channel that carries dry weather flow, and the floodplain and associated wetlands that carry wet weather flow. Some Australian rivers end in important terminal wetlands; others drive estuarine processes that are also important to commercial fisheries and recreation uses.

The relationship between water extraction and deterioration of river health is not a simple one, and is mediated not just by water volumes but flow patterns, contaminant loads and other in-stream (blockages, introduced species) and catchment land use factors (Allan, 2004). This relationship is also unlikely to be a simple linear relationship, but is likely to be characterized by a marked threshold. Extraction up to this threshold are likely to have only minor impacts, but then there may be a sudden change and the system may switch to another state, and this may be very hard, if not impossible to reverse. We have already seen such system switches when phosphorus is added to rivers or lakes for a long time, and then suddenly the systems switch from ones dominated by aquatic plants to ones dominated by algal blooms. In Australia this was seen in the Darling River in the early 1990's when over 1000km of toxic algal bloom appeared in the river. A more recent example has been in the current drought that has impacted floodplain vegetation that has been starved of water due to irrigation extractions over the past decade. Thousands of river red gums have now died and are unlikely to regenerate.

Both of these events were unexpected, and the switches were sudden. Both occurred when the systems were stressed due to drought, and so we must plan and manage not for average conditions, but for the more extreme periods when the stress will be more marked. It is the extreme events that push systems over their thresholds.

A challenge for science is to identify the extraction-impact function. A challenge for communities involved with planning is to decide how close to the edge do they want to be positioned, given the possibility of catastrophic change in some of these systems.

The present approach being developed in Australia is to identify important ecological assets and seek to identify the wetting regimes they need to maintain them. It does not necessarily mean a minimum flow, although in situations where dams block movement of fish this may be part of the requirement. It does not imply a wetting regime delivered over a single year, but perhaps a regime delivered over a decade, depending on the asset involved. The environmental water allocation will comprise some "rules based" water that must be allowed to flow down the river, and some water licenses that can be used at the discretion of the environmental manager. This water may be used to augment or extend a minor flood event to ensure floodplain wetting or extending the duration of wetting to allow a bird-breeding event to conclude. In dry periods it may be used to flush and oxygenate the deeper pools that provide refuges for fish and other organisms.

### **Recovering Water for the Environment**

Reallocating water between various users and between users and the environment is an ongoing challenge. This is the reason so much focus has been given to clarifying access entitlements, separating them from land so that they can be traded, and creating a nationally consistent water market. The logic is that the Government can enter the water market and purchase water to meet broader social objectives, and this was seen as a better adjustment mechanism than an arbitrary reduction of all licenses. Using market mechanisms to recover water is explicit in the NWI and means water will be sourced from those creating the least wealth from it.

Many irrigation communities are opposing using the market to recover water for the environment, in the hope this agenda will just go away. It will not go away and given the climate change situation may well get worse.

We either use the market and take water from its least economic value, or we take an arbitrary 15% cut in all allocations. Taxpayers are prepared to provide funds to restore our rivers to health; farmer organizations have to understand that this is the first and simplest of the ecosystem services the community seeks and unless the funds are used to provide the service, then there is no prospect of a wider ecosystem services payment to landholders.

### **Water Planning**

As we enter the age of water scarcity it is essential we improve our planning of water resources. The essentials of going forward include:

- Consider all possible sources of water – new dams, recycling, desalination and pricing. Nothing should be excluded on doctrinaire grounds.
- Treat all possible sources as a single resource and manage in an integrated way – especially groundwater and surface water.
- Make realistic estimates of future populations and their needs over the planning period of 50 years.
- Make serious assessments of all available options – economic, environmental, greenhouse gas, technical and social.
- Have a diversity of supplies to maximize reliability with uncertain climate futures and with terrorism risks.
- Make users pay the real costs of providing water (including the environmental externalities and management costs) so that water is used efficiently as possible.
- Ensure waste water charges are sufficient to allow water to be discharged to the environment without harm, or used for production if the users can pay the costs of transport. .

Transporting water long distances is expensive in terms of pipelines and pumping costs. The proposed channel from the Kimberly to Perth would have cost about \$15billion and provide water at \$6.5/Kl (cf to around \$1.2 for desalination. Using a canal to deliver this water would double the average water bill for a Perth household. It would indeed be cheaper to transport water by tanker when needed (\$5/KL).

Most of the proposal to find alternative water through pumping, recycling and desalination produce more greenhouse gases that may well exacerbate the climate change we are trying to live with.

Table 1. Australian Greenhouse Gas Emissions from Urban Water (tonnes CO2/ML)

	2001-2	2002-3	2003-4	2004-5
Brisbane	0.8	0.8	0.8	0.8
Gold Coast	1.1	1.3	1.5	1.2
Sydney	0.6	0.7	1.0	1.2
Melbourne	1.0	1.0	1.1	0.8
Canberra	0.3	0.4	0.3	0.4

## The Future

There is no spare water lying around just waiting to be taken off to meet these growing demands. No communities want their water plundered to support profligate water use somewhere else. Water running to the sea is not wasted water, but drives important fisheries that depend on flood pulses. Flood water that just “disappears” on a floodplain drives the vegetation and agricultural productivity of the land. Ask pastoralists downstream of irrigation developments whose water has been pinched how they feel about this.

Australia now has a National Water Initiative which is at the leading edge of world thinking about water management. It has strong political support from the Prime Minister and State Premiers who understand the importance of getting this right as we enter the 21<sup>st</sup> century.

However it is not easy to fix, and much of the failure is due to the institutional arrangements we have created to manage water. Many interest groups are frightened of change and are concerned they will miss out with the changes now underway. However, in my view "business as usual" is one of the high risk options for the future, with a high likelihood that communities will just run out of water and that we will not be able to provide the food and ecosystems services upon which we all depend.

The key to going forward is to make the National Water Initiative work. Better measurement, better reporting, better planning, using water market to readjust and allow redistribution and better charging are the foundations for a water future for Australia.

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