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Flying Blind – The Disconnect between Groundwater and Policy

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Introduction

Australia is likely to become more dependent on groundwater resources in the coming decades as many areas confront real water scarcity. Before we increase our reliance on this important resource it is essential we know exactly what the resource can sustain, and what are the risks we might confront? Rapid urban growth on the East coast, the insatiable demands from agriculture and the growing realization that some water must be left in the rivers if they are to be healthy are all contributing to the looming water shortage.

Demand for water is increasing at a time when rainfall and hence runoff is decreasing in SE Australia. The last 10 years have been much drier in Eastern Australia than the previous 50 years. Four Victorian rivers show the problem - in the last decade the flow in the Wimmera, Loddon, Werribee and Moorabool rivers has been between 18% and 40% of the long term average flow. The dry spell in Victoria is now seen as a 1 in 400 year event, and the collapse of autumn rains means that winter/spring rain is less likely to run off a now dry catchment.

Planning for Water Security in the Face of Scarcity

Last century, planners and Governments approved developments and then called on water engineers to provide the water. It was unthinkable then that lack of water might restrict development. The engineering profession responded by building dams with scant consideration of either the economics or the ecological impacts. Now all the easy dam sites are built, and so this strategy has run its course in many parts of the country.

The Prime Minister has called for radical new thinking to confront this challenge, and we, as water professionals, have the opportunity to respond to this challenge.

So what might 21st century water planning look like:

- **Demand Assessment** – realistic population projections and water usage per person for housing, open space and industry, at various price levels.
- **Identify all Possible Sources –** the quantities, quality and reliability of catchment water, new dams, groundwater, inter-basin transfers, stormwater, recycling and desalination, as well as purchase from others holding entitlements to water. Nothing should be discarded on doctrinaire grounds.
- **Comprehensive Assessment** of the technical, economic, environmental, greenhouse and social impacts of using each of the possible sources.

- **Engage the community** so they understand the trade-offs but don't let interest groups hold the process to ransom. Governments must govern rather than retreat to referenda.
- **Spread risk** by having a range of alternative sources.
- **Plan and approve in advance** so lead times are understood and minimized in case climate change is even more rapid that it now appears.

The National Water Initiative

In 2004 the Prime Minister and State Premiers signed the National Water Initiative (NWI). This initiative is world's best practice, and our challenge is to implement it and make it work. The key elements of the initiative are:

- Water Access Entitlements that give security to those holding water access licences.
- Planning Framework within which Governments might issue further access licences, but that implement firm pathways for returning previously over-allocated and/or overdrawn surface and groundwater systems to environmentally-sustainable levels of extraction.
- Water Resource Accounting - provides for water accounts for each catchment showing extractive and environmental entitlements and actual allocations.
- Water Markets and Trading - seeking a nationally consistent water market allowing water to trade to the most beneficial use, across State borders where appropriate.
- Best Practice Water Pricing

Groundwater Elements of the NWI

Water Access Entitlements and the Planning Process	Enhance the security of water access entitlements. In overallocated systems this means reducing the number of entitlements**.**
Planning process	Planning processes with opportunity for productive, environmental and other public benefit considerations to be identified and considered in an open and transparent way;
Adaptive management	Provide for adaptive management of surface and groundwater systems to meet productive, environmental and other public benefit outcomes;
Return of over allocated systems	Implement firm pathways for returning previously overallocated and/or overdrawn surface and groundwater systems to *environmentally-sustainable levels of extraction*;
High conservation systems	Identify surface and groundwater systems of high conservation value, and manage them to protect and

	enhance those values;
Water Resource Accounting	To ensure adequate measurement, monitoring and reporting systems are in place to support public and confidence in the amount of water being traded, extracted for consumptive use, and recovered and managed for *environmental and other public benefit outcomes*.
Connected systems	Agree to identify by end 2005 situations where close interaction between groundwater aquifers and streamflow exist and implement by 2008 systems to integrate the accounting of groundwater and surface water use
Data	Improve the coordination of data collection and management systems to facilitate better sharing of this information;
Metering	Metering should be undertaken where water access entitlements are traded; and in an area where there are disputes over the sharing of available water;
Reporting	Develop by mid 2005 and apply national guidelines by 2007 covering the application, scale, detail and frequency for open reporting
Knowledge and Capacity Building	

Knowledge is the key to delivering on this Initiative and the foundation upon which we can meet the water needs of Australian society. We do not yet have the knowledge we need to meet these needs. We have run down our stream gauging networks over the last 20 years once the Commonwealth stopped funding this area. We have run down the intellectual skills in water agencies and some jurisdictions now seem to lack the capacity to do the job.

We have surely learned from our mismanagement of surface water in the 20th century that flying blind is not a very smart strategy. Before communities become dependent on groundwater it is essential to make sure we understand the resource – in particular what are the long term sustainable levels of extraction and what might be the recovery times and the impacts if we mine this resource. This knowledge, based on field data and models that enable prediction is the foundation upon which sustainable and secure water can be assured. The resources available for this task and the capacity to undertake it does not at this time seem adequate for the challenge.

Groundwater Lessons from the 20th Century

We have already made many mistakes with our exploitation of groundwater, and should recognize these and avoid them, in the future.

Connectivity – we have learned that if we over allocate groundwater then surface water will dry up after a significant lag period. Not all of our systems are interconnected, but to assume none are has

been a costly mistake. This century we should assume surface and groundwater is directly connected unless proven otherwise.

Substitution – we learned last century that if we cap surface water extraction, people will substitute groundwater.

Contamination – we need to understand the intake areas for our groundwater systems and we may need to control land uses on such areas to prevent contamination of the groundwater resource. The chemical contamination of the Botany sands in Sydney has reduced options for Sydney's water supply.

Over-extraction – if we allow over extraction groundwater levels will fall, increasing pumping costs and possibly causing the resource to fail. We have already had to commit substantial public funds to addressing over allocation in Northern NSW. Saltwater intrusion in aquifers near the coast is another consequence of overuse.

Waterlogging and Salinisation – we have finally learned the key role of catchment vegetation in determining the water balance and that removing deep rooted plants can lead to rising water tables, causing waterlogging, and if there is salt in the soil profile, salinisation and the destruction of agricultural land and community assets.

Encouraging Sub Optimal Use of the Resource – if we encourage or allow use of water for low economic value uses then it becomes very difficult to recover this water to use it for more essential functions. Individuals invest and expectations grow that water will be available and these people expect compensation when the water is needed for other uses.

A Groundwater Strategy for the 21st Century

It is now obvious that many communities are seeking to use groundwater to assist with their water shortages. We have already seen this in the Sydney Metropolitan Water Strategy and in the Central Region Sustainable Water Strategy in Victoria.

I am concerned that the knowledge upon which we are building these expectations is not solid enough, and that we might have some costly failures. Groundwater may well be an important part of the solution to water scarcity, but it needs to be understood and managed in a sustainable way and fully integrated with our understanding and management of surface water. This seems beyond our current institutional arrangements.

It is now time to develop a National Groundwater Strategy to ensure groundwater is understood and managed along with our surface water resources. The NWI provides the framework of what needs to be done.

- Funding
- Building Capacity
- Agreeing on Common Definitions and Protocols
- Assessing the Groundwater Resource – location, quality and sustainable yield

- Public Availability of Data and Interpretations
- Incorporate Groundwater into Regional Water Planning
- Identification and Management of Groundwater systems of high conservation value
- Measurement of Groundwater being extracted into building into river valley water accounts
- Policing of groundwater extraction to ensure compliance

Understanding the Groundwater Resource

To avoid making further costly mistakes with groundwater I believe we need to reverse the burden of proof. We should assume aquifers are connected to surface water unless proven otherwise, and we should assume any further extraction of groundwater is not sustainable unless demonstrated otherwise. When it is necessary to mine the groundwater over a short period we need to be clear that this is what we are doing and understand the recovery time and long term impacts of such an approach. It seems to me we need to know:

- Where are our good aquifers?
- At what depth is the water, and what flow rates can be expected?
- What is the quality of the water, and what must be done to protect or restore it?
- What is best practice methodology for assessing the sustainable levels of extraction of an aquifer, and what are acceptable levels of stress for an aquifer in the short term?
- Where are the intake areas for the aquifer?
- Are there risks from land uses on the intake areas that we will damage the resource?
- What might be the recharge rates under various climate change scenarios?
- What must we do to restore already over-allocated groundwater system?
- What are the connections with surface features – rivers and wetlands that may be affected by groundwater use?
- What other Groundwater Dependent Ecosystems might be at risk? Which ones should we seek to protect, and what is needed to protect them?
- What entitlements exist for groundwater and when are they exercised? This must include all those accessing groundwater including mining, construction and stock and domestic.

In implementing the NWI jurisdictions need to ensure adequate measurement, monitoring and reporting to support public and confidence in the amount of water being extracted. As a condition of licensing, extraction data and flow rates should be made publicly available to ensure the best possible knowledge base of groundwater resources,

The National Water Initiative commits to identifying over allocated systems and returning them to sustainable levels of extraction. The history of groundwater management in Australia has been one of over optimistic assessments of sustainable yields, and the need to subsequently reduce these estimates, at times with calls to compensate those who invested on the basis of earlier optimism. It is difficult to come up with a number for the sustainable yield, but without this there is little chance of effective management or the development of trading in groundwater entitlements.

Active Management of the Groundwater Resource

Last century Governments encouraged the development of groundwater with little understanding, and took the view that they could redress any problems through a process of "adaptive management". However, landholders and communities developed expectations, and when the groundwater ran out believed Governments should compensate them for encouraging them to invest in a resource which was illusionary. Substantial taxpayer funds are now being invested in Northern NSW to redress these mistakes.

States have worked with the Australian Government to cap and manage water in the Great Artesian Basin. This work has some way to go, but has been a tremendous success in reversing the loss of pressure arising from profligate use of this artesian water.

There are still many parts of Australia where groundwater are neither licensed nor metered. As a first step, there should be a moratorium on any new bores taking groundwater unless it can be shown that the groundwater system is not overallocated. This is a simple application of the precautionary principle – don't spend without understanding your limits. Any new bore should be licenced and metered, and any theft of water should be treated by withdrawing the entitlements. All existing bores should be registered and metered within 5 years, or should be shut down.

Many of the ways forward were identified as part of the 1994 CoAG Water Reforms and in 1997 a National Framework for Improved Groundwater Management in Australia was released by a Task Force on COAG Water Reform. Much of this appears to have been ignored by States. Since then more work has demonstrated the importance of Groundwater Dependent Ecosystems and the need to manage groundwater to protect these values (eg Murray et al 2003, Boulton 2005).

Management agencies need to withdraw groundwater licences that have not been used. The failure to withdraw sleeper licences when surface water trading commenced saw them activated and traded with serious consequences.

Investing to Overcome the Capacity Problem

We need to build our national capacity in groundwater hydrology. We have let this capacity run down in State Agencies and the lack of employment opportunities has affected student interest. We should not encourage all 36 Universities to pretend they have a groundwater program by employing one ort two junior lecturers. We should identify the best 2-3 groundwater groups in the country, and the Research Quality Framework should help identify those who have capacity from those just with aspirations. We could provide these groups with postgraduate awards and funds to assist with field work. We could ensure they have up to date equipment and have ready and easy access to all groundwater records.

But all this will be to no avail unless there are jobs at the end of line for graduates. We should invest to build capacity in the States to understand and manage groundwater, and these investments could provide jobs and demonstrate a career exists for those with these skills. This is not a quick fix, but requires patient investment over at least a decade.

Conclusions

The pressures on our water resources are increasing and groundwater is seen by many as the solution to their shortages, especially as surface water is reduced due to climate change. However, groundwater resources are also replenished by rainfall, and are also under stress.

Flying blind and hoping in this area is not a smart strategy, and if communities are to make better decisions they need to have the knowledge about the groundwater resource that enables good decisions to be made. We must have a no regrets policy that does not remove future options or create grounds for large compensation payments. Communities must demand that political leaders take control and responsibility for putting in place management regimes that benefit all of the community not just a favored few.

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