

Groundwater as the Cinderella of Water Laws, Policies, and Institutions in Australia

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ABSTRACT

Groundwater is often overexploited in many parts of Australia. The reasons for the overexploitation vary regionally but most relate to the laws and policies which were designed to promote water development as a means to community development. Currently, there are many laws and policies which seek to undo this and require the achievement of ecologically sustainable development.

This paper divides the laws, policies, and institutions in to three paradigms.

The first was the dominance of the common law of groundwater which promoted the tragedy of the commons as it reinforced the notion of individual growers as owners of the water below their feet. This lasted up to 1896.

The second phase which persists today was vesting of management control in the Crowns of each State. Such vesting happened later than the vesting of surface water and hence the Cinderella analogy in the title of this paper. The second part of this paper looks at some groundwater management laws and institutions between 1896 -1997.

The third phase goes up to the present time post the 1995 Council of Australian Governments reforms of water laws, policies, and institutions where once again surface water was approached first. The third phase involves the federal government in initiating changes to State government laws, policies and institutions through fiscal and other incentives.

The final section looks at the most recent federal government initiatives support conjunctive management of ground and surface water, the use of markets to allocate water. These are achieved through water planning processes that require all allocations to be expressed as a share of an available resource. The share formula requires that environmental sustainability be accounted for.

Key words: Australian Groundwater Laws, Groundwater Policies, Groundwater Institutions

INTRODUCTION

The primary legislative bodies are the State governments. The federal government has no direct legislative power but since 1995 has been influential in setting the State legislative agendas. The second section will examine the history of the types of regulation of Groundwater over all the States up to 1995. There is a legacy of uncertainty over groundwater ownership. The next section will examine the Federal Government government policy interventions and the institutional changes regarding groundwater management since 1995. The fourth section will examine the new State laws, policies and institutions about groundwater ownership and control since 1995.

1. GROUNDWATER USE IN AUSTRALIA

Australia has 25,780 GL of groundwater that is suitable for potable, stock, domestic use, and irrigated agriculture that can be extracted sustainably each year. Of this, only 2,489 GL are currently used. Whilst this appears positive there are spatial differences between regions which means there are severe over-allocation problems in many parts of Australia.

Two thirds of the water used in Perth comes from groundwater.

Groundwater is the principal source of drinking water for 600 communities with a total population of 1 million people across Australia.

18% of total Australian water use comes from groundwater.

In Australia the role of groundwater as a significant component in the physical environment has only recently been realized. (National Water Quality Management Strategy 1995)

168 of Australia's 538 groundwater management units are close to being over-allocated, and 161 are over-used. Three of the groundwater management units across Australia have formal environmental allocations. Allocation decisions need to take account of groundwater dependent ecosystems. Examples of groundwater dependent ecosystems systems include the mound springs of the Great Artesian Basin, Swan coastal plain wetlands (Western Australia) and river-based flow systems of the Great Dividing Range. While detailed assessments have been undertaken for some systems, such as the Swan Coastal Plain wetlands, most assessments to date have been rudimentary. The State and Territory water management agencies will continue improve the definition, methods of assessment and determination of sustainable yield through the activities and initiatives of the National Groundwater Committee

The four-class classification system was developed by the National government as part of the National Land and Water Audit in 2000 to provide a simple method to communicate the status of the use and allocation of Australia's water resources in relation to sustainable water management.

Table 1: Number of groundwater management units and their usage (Use) and allocation (Alloc) development status* Water use as a percentage of sustainable flow regime (surface water) and sustainable yield (groundwater)

Region	Over > 100% developed		High 70 – 100% developed		Medium 40 – 70% developed		Low < 30% developed		Total with Available Information	
	Use	Alloc	Use	Alloc	Use	Alloc	Use	Alloc	Use	Alloc
Australia	55	79	110	85	93	63	275	282	534	534
Australian Capital Territory	0	0	0	0	0	0	3	3	3	3
New South Wales	6	21	7	6	15	6	25	20	53	53
Northern Territory	4	4	1	2	5	1	45	48	55	55
Queensland	29	35	28	9	26	7	19	52	102	103
South Australia	2	2	16	16	8	4	24	3	51	50
Tasmania	0	0	0	0	2	2	15	15	17	17
Victoria	12	15	16	10	11	17	40	37	79	79
Western Australia	2	2	42	42	26	26	104	104	174	174

It is important to recognise that adequately quantifying a sustainable flow regime or sustainable yield and consequent operating rules is a complex matter. State, Territory, and scientific agencies continue to develop and apply methods and measures for determining sustainable flow regimes and sustainable yields in sub regions of their States.

Table 1. shows that 38% of Groundwater units are highly and over developed based on allocation, while 35% are highly or overused. Evans R (2001). The 38% falls in the Groundwater management units that are the best groundwater resources of Australia. The sustainable yield of a groundwater resource is defined as the groundwater extraction regime, measured over a specified planning time frame, that allows acceptable levels of impact and protects higher value uses that have a dependency on water.

Surface water use is also a problem in the main irrigation area the Murray Darling Basin. As a response to the appreciation that surface water demands would exceed sustainable limits by 2020, the MDBC capped extraction of surface water in 1995 to the 1994 levels. McKay (2005). This has resulted in increased demand for groundwater. The groundwater use in the nation nearly doubled from 2634 MCM in 1983/4 to 4171 MCM and 1996/7. In New South Wales, Victoria and Western Australia the uses tripled over those times, NSW went from 308 to 1008, Victoria from 206 to 622 and WA from 373 to 1138 MCM. Australian Water Resource Assessment (2000).

2. THE COMMON LAW OF GROUNDWATER USE IN AUSTRALIA UP TO 1896 - THE TRAGEDY OF THE COMMONS.

Groundwater is regulated under 7 State and Territory jurisdictions each with different laws and different degrees of reliance on groundwater. There are some cross border agreements for example between SA and

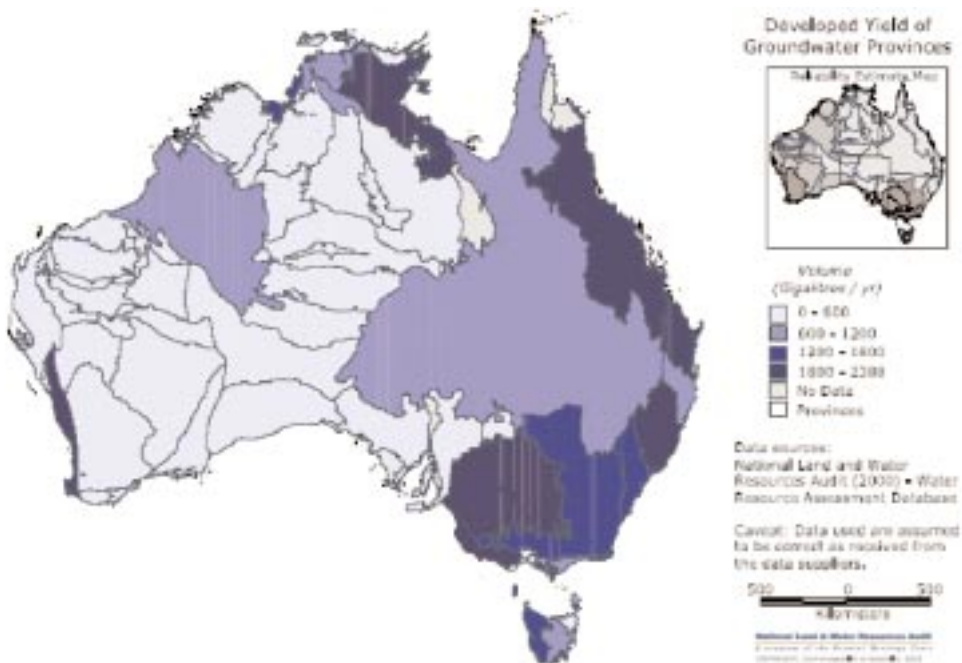


Figure 1. Developed Yield of Groundwater

Victoria with regard to a vital aquifer in the SE and between NSW, QLD, SA and NT over the Great Artesian Basin. Otherwise, the management regimes are introspective focusing on one State.

The common law of England was applied by the High court of Australia to groundwater in Australia despite vast differences in climate. This clearly gave the owner of the land above an unimpeded right to use and exploit groundwater. The Judges in the two leading law cases *Gartner v Kidman* (1962) 108 CLR 12 at 21-23 and *Dunn v Collins* (1867) 1 SALR 126 commented that English law applied despite it being drafted for a much wetter climate where groundwater is not so important.

See Table 2. This mindset explains some of the reasons why groundwater has been overexploited in many parts of the nation for so long. At common law a neighbour would not be able to win an action against their neighbour who ran the wells in a region dry. This is because the common law treated surface water and groundwater differently. The surface water rule (known as the riparian doctrine) clearly imposed limits of users to preserve the river. The groundwater rule did not impose such limits. The groundwater rule lack of limits inevitably encourages the tragedy of the commons.

The harshness of this rule was mitigated by a variety of statutes in the States starting from 1896 a full 100 years after white settlement.

The authoritative case in Australia with respect to common law riparian rights is *Dunn v Collins* (1867) 1 SALR 126. Wearing J's judgment begins at p135 and summarizes the common law rights with respect to

numerous types of water resources, including groundwater This decision gives a concise definition of the common law riparian doctrine as it is authoritatively explicated by Lord Kingsdown in *Minor v Gilmour* (12 Moore PCC 133) the relevant cases are summarized in Table 2.

The common law specifically recognised that although the overlying land-owner is not the owner of the water, he has an unlimited right to appropriate it (*Ballard V Tomlinson* (1885) LR 29 Ch.D 115) and use it for whatever purposes he pleases, either on or off the overlying land (*Chasemore v Richards* 1859 7 H.L.C 349) even if his sole purpose is malicious intent to injure his neighbours wells. (*Mayor of Bradford v Pickles* 1895 A.C 587, 594.)

3. VESTING TO CROWN IN EACH STATE THE RIGHT TO USE, FLOW AND CONTROL OF GROUNDWATER – LAWS, POLICIES, AND INSTITUTIONS BETWEEN 1896 -1997.

The common laws rules above were replaced by a licensing and allocation system for both surface and groundwater. In the case of Victoria, the Groundwater Act 1969 was drafted to overcome a severe crisis in town and agricultural water supply in western Victoria. (Clark SD and AJ Meyers 1969) This was a consequence of the vesting provisions. Each State created their own system and each provided open access to the resource i.e. no caps on the number of bores or amount of water drawn. There was no payment for the water but every farmer had to pay for the bore and associated reticulation infrastructure. The consequence of this was to continue the common law system as above. Each user was allocated amounts at will and no individual therefore had an incentive to reduce use. In some places such as the Great Artesian Basin (see Box 2) many uncapped bores were put in and water freely flowed all day and night.

The vesting of surface water in the Crown in right of the State generally came first (see Table 2). In the southern States this was heavily influenced by Alfred Deakin and his assertion of the interest of government in the planned exploitation, conservation and distribution of water in surface channels mainly in irrigation communities. (Clark SD and AJ Meyers 1969). The judge in *Dunn v Collins* recognised that a change had occurred:

Common law rights (and obligations of riparian proprietors in respect of natural watercourses) may be, and in England and America frequently are, either abridged or destroyed by the operation of grants, or by adverse enjoyment for twenty years, which raises the presumption of a grant, and which converts what otherwise would have been either a dominant or an independent into a servient tenement.

Dunn v Collins as per Wearing J at 139.

A grant or licensing system was created in each State for both surface and groundwater with the in the Crown of the right to the use, flow and control of the groundwater. This was often vested in a different government agency to that dealt with surface water. The vesting provision certainly created the power to require licenses for wells and wide ranging powers to manage.

One question of law has remained however about this vesting provision. That is does this vesting provision create exclusive rights in groundwater by each of the Crowns in the right of the States? Hence in the event of changes to allocation is compensation payable? The answers seems to be that the rights of the Crown

Table 2. Australian Surface and Groundwater Common Law Rules Relating to Water Use up to 1886.

<p>Common law legal rule <i>Dunn v Collins</i> (1867) 1 SALR 126</p>	<p>Surface Water In Defined Channel</p> <p>Riparian doctrine applies</p> <p>Riparian rights are, therefore, usufructory rights that do not confer exclusive possession in the water upon the owner of the property through which the water is flowing but merely a right to use and benefit from the water and only to the extent that other riparian right owners are not detrimentally affected. <i>Dunn v Collins</i> at p 136</p>	<p>Groundwater Water Percolating Through Underground Strata, With No Certain Course, No Defined Limits,</p> <p>Riparian doctrine does not apply. hence unlimited use</p>	<p>Groundwater In Defined Channels</p> <p>Riparian doctrine does not apply hence unlimited use</p> <p><i>'Acton v Blundell</i> 1843</p> <p>a person who owns the surface may dig therein and apply all that is found to his own purpose at his free will and pleasure and that if in the exercise of such right, he intercepts or drains off the water collected from underground springs in his neighbours well, this inconvenience... cannot become ground for an action. Quoted in :<i>Dunn v Collins</i> as per Wearing J at p 140.</p>	<p>Groundwater In Defined Channel Connected To Surface Water In Defined Channel</p> <p>Riparian doctrine applies but use in unlimited. <i>Dickenson v The Grand Junction Canal Company</i> decided that if a person possesses a right to a stream jure naturae he has a right to its subterranean course. So that the test of the validity of a parties claim to the usufruct of water in a subterranean channel is whether he has or has not a legal right to the usufruct of a watercourse at the surface, which is fed by the underground channel': <i>Dunn v Collins</i> as per Wearing J at p 141.</p>
<p>ownership</p>	<p>Riparian is not an owner use of the water. May use it for ordinary purposes such as domestic use. With domestic use the riparian may take all the water. The riparian can also make extraordinary use of water only if that does not affect those above or below the riparian user.</p>	<p>Morevoer, if the underground water has been accessed by a man-made well or bore then the water is accessed via an artificial structure and, therefore, absolute rights will be vested in the proprietor who brought the water to the surface as the riparian doctrine only applies to naturally occurring water</p>	<p>Morevoer, if the underground water has been accessed by a man-made well or bore then the water is accessed via an artificial structure and, therefore, absolute rights will be vested in the proprietor who brought the water to the surface as the riparian doctrine only applies to naturally occurring water</p>	<p>Morevoer, if the underground water has been accessed by a man-made well or bore then the water is accessed via an artificial structure and, therefore, absolute rights will be vested in the proprietor who brought the water to the surface as the riparian doctrine only applies to naturally occurring water</p>
<p>remedy between citizens for over use by a fellow citizens</p>	<p>yes depend on type of use</p>	<p>no unless trespass to steal the water</p>	<p>no unless trespass to steal the water</p>	<p>no unless trespass to steal the water</p>

Table 3. Dates of the supplanting of common law of groundwater use by Statutes vesting control in the Crown for selected Australian States up to 1999

State	Victoria	NSW	WA	SA	Tasmania	ACT
Surface Water Vested In Crown	1886 preserved common law of groundwater explicitly	1896	1914	1885	common law left intact	
Groundwater Vested In Crown	1969	1912	1914	1959	common law left intact	some groundwater not vested in the crown. Common law applies
			Act being amended generally	1997 Abolition of common law rights		Rashleighs case some water under common law some under statute <i>Rashleigh v Environment Protection Authority [2005]</i> ACTSC 18 (18 March 2005);
Exclusive Or Non Exclusive Vesting Provision	Non exclusive to Crown	Non exclusive to Crown	Non exclusive to Crown	Exclusive to Crown	non exclusive to Crown	
Remedy Between Citizens For Over Use Of Groundwater				229 Natural Resources Management Act 2004 (S.A.) (NRMA) compensation available if damage occurs as a result of breach of license conditions.		

are not exclusive because they provide for the recognition of common law rights such as domestic use the so called Stock and Domestic rights. (*Hayes v Northern Territory* [1999]FCA 1248).

Another outcome of the non exclusivity is that native title rights to groundwater may revive. Hence, common law rights could revive and this is the essence of present debates about Stock and Domestic rights under the schemes. However, as in SA the State could extinguish any common law rights and Queensland has moved to license Stock and domestic users. As for compensation changes to allocations this has been a hard political battle in present times.

The surface and groundwater laws were administered by a multitude of government agencies in each State with the resulting systems being very complex for the landowner. In Victoria the initial system is described in Box 1 and whilst this is coherent in that it tries to co manage surface and groundwater it seems to have been unduly complex for the landholder.

Institutional schemes were fragmented from the beginning in Victoria as described in Clark and Myers 1969.

Box 1. Institutional Fragmentation in Early Groundwater Administration in Victoria

In Victoria, Groundwater Act of 1969 was described as....

Manifesting an unhappy and complex division of functions between the Department of Mines and the State Rivers and Water Supply Commission which sets an sophisticated barrier of official correspondence between farmer and the water under his feet.

The Commission was nominally responsible for investigating groundwater resources but by administrative arrangements the Dept of Mines took this over. The act appoints Mines to authorise the construction of bores, to control drilling operations and issue completion certificates. The Commission is to be consulted in these matters but is solely responsible for the licensing and control of extraction. For the irrigator wishing to drill a bore there are ten stages of official documentation between himself the Commission, the Mines Dept and the driller.

As groundwater issues became pressing, the individual State governments did co-operate to undo some of the legacy of the open access uncapped bores. Box 2 shows how four state governments created a scheme to cap bores in the Great Artesian Basin and hence restore pressure.



 Box 2. Great Artesian Basin Rehabilitation Program

The Great Artesian Basin is the largest artesian basin in the world and underlies about one fifth of arid and semi arid Australia under four States. It covers an area of over 1.7 million km² and has a capacity of 8700 teralitres. The area was mined by more than 4000 flowing bores. By 1990, 1000 of these has stopped flowing. (State of Environment advisory council Report, 1996).

The major use of the water is for livestock as the dissolved minerals make it too salty for other purposes. The main issue has been the loss of pressure. The pressure of an individual bore is dependent on the drawing of water from nearby bores as the lateral movement of water is very slow. The great Artesian Basin Rehabilitation Program started in 1989 and aims to encourage the capping of bores and piping of water. It is funded by the Commonwealth and States. The cost sharing scheme for bore capping and pipes work is funded 80% by State/Commonwealth and 20% by growers in NSW and Queensland.

In SA the work is focused in one area with State and Commonwealth picking up the tab. The take up was slow of the 1380 uncontrolled bores in 1989 only 250 were repaired in 1997. To the landholder the cost of the works to save the water was too high. The Great Artesian Basin Consultative Council was established to manage the GAB and consists of groundwater users, industry, local government, traditional owners, conservation groups, and governments. Funding is shared equally between NSW, QLD and SA. This is a good example of a shared co-operative inter-governmental regime.

4. GROUNDWATER LAWS, POLICIES, AND INSTITUTIONS POST THE 1995 COUNCIL OF AUSTRALIAN GOVERNMENTS (COAG) REFORMS

For the last 10 years, the Australian Federal Government has used financial persuasion to bring about institutional reforms within Australian water businesses to push them to achieve Environmentally Sustainable Development ESD in water management. The ESD requirements were endorsed by the Federal government in 1992, This scheme is described at <http://www.deh.gov.au/esd/national/nescd./strategy/index.html> and had three broad objectives:

- to enhance individual and community well being by following a path of economic development that safeguards the welfare of future generations
- to provide equity between generations, and
- to protect biological diversity and maintain essential ecological processes and life support systems.

The CoAG reforms of 1994 concentrated on surface water it was not until 1996 that CoAG endorsed a set of principles Jurisdiction to use in groundwater reform Industry Commission (1997). Once again the Cinderella type of water. The National water Initiative of 2004 further supports the CoAG aims and with respect to groundwater integrates groundwater into the framework by saying...

We need to continue to improve the productivity and efficiency of our water use, while maintaining healthy river and groundwater systems....

The NWI addresses the vital importance of such questions to Australia. It encompasses a wide range of water management issues and encourages the adoption of best-practice approaches to the management of water in Australia. In particular, the NWI will result in:

- *expansion of permanent trade in water bringing about more profitable use of water and more cost-effective and flexible recovery of water to achieve environmental outcomes*
- *more confidence for those investing in the water industry due to more secure water access entitlements, better and more compatible registry arrangements, better monitoring, reporting and accounting of water use, and improved public access to information*
- *more sophisticated, transparent and comprehensive water planning that deals with key issues such as the major interception of water, the interaction between surface and groundwater systems, and the provision of water to meet specific environmental outcomes*
- *a commitment to addressing overallocated systems as quickly as possible, in consultation with affected stakeholders, addressing significant adjustment issues where appropriate, and*
- *better and more efficient management of water in urban environments, for example through the increased use of recycled water and stormwater.*

The NWI was agreed to and signed at the 25 June 2004 meeting of the Council of Australian Governments (COAG). The NWI Agreement was signed by the Commonwealth and all States and Territories, with the exception of Western Australia and Tasmania: <http://www.pmc.gov.au/nwi/index.cfm>.

The surface water reforms were institutional reforms aimed at improving water markets, separating the monolithic functions of the public sector water allocation bodies into three segments water supplier, environmental manager and price regulator. The reforms required a shift away from the existing fairly simple and coherent regimes of urban and rural regional bodies. The pre CoAG regimes had the Crown as the prime allocation body however the regime were not coherent in that ground and surface water were often allocated independently of each other. (See Box 1)

Over-allocation of groundwater occurred because of historical circumstances such as relying on the stated intention of the applicant, inaccurate crop/area formulas (Evans R 2001) inaccurate understandings of the sustainable yield of the aquifer, poor measurements and lack of metering.

The table below described the management initiatives undertaken in selected over-allocated and over used groundwater systems by State agencies. In Queensland groundwater surface waters are managed together.

Management of groundwater and surface water resources will be under a single water resource plan as the plans are completed under the Water act 2000. A plan covers the whole of a stream catchment. The current licensing regime allows for conjunctive use of groundwater and surface water where there is intimate connection between the two water sources. The plans and any modelling that supports plan development take into account any connection between groundwater and surface water systems

Table 4 Case examples of management processes on over allocated groundwater systems in Australia 1960 - 2000

State	Locations	Method to Manage Over-allocation	Inter-sectoral Competition
NSW	Lower Namoi, lower Murrumbidgee lower Murray lower Lachlan	Groundwater committees formed to develop management plans advise Minister under Water Management Act	Between farmers
WA	Collie basin	Stakeholder based advisory group appointed by Government	Coal mine dewatering power station cooling demands adoption of more expensive alternative water supply for power generation. Take 30 year to recover
Qld	Pioneer Valley alluvial aquifer	Pumping restrictions since 1992 and installation of meters water resources plan to provide a plan form allocation with more efficient on farm use	Irrigation town water supply and some industrial purposes
	Bundaberg Alluvial aquifers	In the 1960s substitution of surface water from groundwater and reduction on irrigation allocation since the 1970's annual allocation system since 1989 with involved groundwater modeling and consultation with users on annual allocation figures water resources plan with incentives for more efficient on farm use of water.	Irrigation town water supply and some industry
	Central Lockyer	Provision of surface water to supplement stream recharge and provides surface water as a substitute. Weirs for groundwater recharge purposes, meters installed and allocation limits water resources plan in process	Horticulture and fodder crops
	Upper Condamine	Water users deepened bores. Ceased allocating groundwater in 1969 and metered bores and substituted surface water for groundwater. System of announced allocations to limit use to 70% of the 72,000 which is still over-allocated and unsustainable.	Irrigation and town water yield 27000ML/yr allocation at 2000 72,000ML/yr down from peak of 79,000 ML/yr
	Mt Larcom see Halaniak D and JM McKay 2003	Dewatering of land by mining operations. Community pushing for Water Resources Planning process	Irrigation, intensive farming and mining
SA	Hundred of Stirling Adelaide Hills	Irrigation since 1969 with saline water. As salinity increased there was a shift to higher tolerant crops and community demands for more monitoring. A community based water resources advisory committee formed in 1995 which recommended a 35% reduction of allocation to ensure sustainable yield. The reduction adopted in 1996 on a voluntary basis.	Irrigation of salt tolerant species
	Tintinara prescribed wells are South East SA, see McKay JM, Diwakara H and S Barnett 2005	A cost sharing scheme implemented to subsidize the lowering of stock and domestic wells	Stock and domestic users losing water because of irrigators

Source: Case Examples of Managing Overallocated Ground Water Systems occasional paper 2002 Natural resource Management Standing Committee and as specified.

In 1996 another federally run body the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ) issued the first national policy position on groundwater management. (Evans R 2001).

The 1994 Water Reform Agreement required ARMCANZ to provide advice to jurisdictions on improvement in groundwater management, with particular reference to pricing of groundwater. To meet this requirement, a Policy Position Paper: *Allocation and Use of Groundwater, A National Framework for Improved Groundwater Management in Australia* was prepared by the Subcommittee on Water Resources and the COAG Task Force on Water Reform. It was subsequently accepted by ARMCANZ and published in December 1996.

This paper was adopted by CoAG and had 12 recommendations. Primarily, States have responsibility for all recommendations except for Rec 10 and 12. They have secondary carriage for Rec 1. Rec 10 is the responsibility of the Reporting Jurisdictional Progress on Groundwater Reforms of the federal government whilst SCARM/NGC (on behalf of all jurisdictions) is responsible for Rec 12.

In 2000 the National Groundwater committee National Groundwater Committee (2000) reviewed the recommendations and gave a score out of ten for the overall national progress against the recommendation. The preface indicated that:

...in general, much progress has been achieved against the 12 recommendations of the Groundwater Management Framework. However, progress has been patchy both across jurisdictions and across recommendations.

It is apparent that some jurisdictions still do not have full ownership of all recommendations.

There appear to be some fundamental impediments against progress in some areas – impediments that may only be removed by re-defining the recommendation. In other areas, impediments appear to be related to jurisdictions following their own approaches at the expense of a national one...

Recommendation 1:

Groundwater management policies should employ the principles of ecologically sustainable development and should be directed at achieving the sustainable use of the resource. ARMCANZ should develop a nationally consistent definition and approach to sustainable groundwater yield.

Score: For the first part of the recommendation: 7; for the second part of the recommendation: 9

Recommendation 2:

All States should adopt the National Drillers Licensing system for water production wells by 1997 and should seek to expand the system to all drilling better integrated including approaches to pricing (especially adjacent to public surface water regulated schemes), water allocations and trading to ensure consistency.

Score: For the first part of the recommendation: 9; for the second part of the recommendation: 5.

Recommendation 3:

Groundwater and surface water management should be better integrated including approaches to pricing (especially adjacent to public surface water regulated schemes), water allocations and trading to ensure consistency.

Score: 5

Recommendation 4:

In preparing groundwater management plans, policies and strategies, States should ensure that the efficient utilisation of groundwater resources is not compromised by the protection of existing users with inefficiently designed or constructed wells. This particularly applies to domestic and stock wells.

Score: 6

Recommendation 5:

States should develop groundwater management plans based on a sound understanding of the resource. These plans should be the primary support for the development of groundwater allocation and property right systems to support intra-aquifer trading both within States and across State borders.

Score: 3

Recommendation 6:

In developing groundwater management plans, State agencies responsible for groundwater management ensure that those plans include identification of the sustainable yield and the levels of allocation and use of aquifers. Those plans should also include an identification of environmental water provisions in accordance with the principles set out in the joint ARMCANZ and ANZECC "National Principles for the Provision of Water for Eco Systems". Where allocations exceed the sustainable yields, the agencies should develop strategies to reduce abstractions to sustainable levels within time frames which minimise permanent damage to the resource.

Score: 1

Recommendation 7:

The provision by the driller, to the relevant State Authority, of well construction data should be mandatory requirement, with provision made for exemption in area, or circumstances, where the information is not required.

Score: 7

Recommendation 8:

In all areas where there are high yielding wells, monitoring and data collection of water levels and water quality should be undertaken to a sufficiently high standard to ensure adequate information is available to manage the resource sustainably. Where licensing is used as the primary mechanism for data collection, the provision of necessary management information will generally require the licensing of high yielding wells.

Definitions of high yielding wells will vary between resources, as the criteria used to define such wells would include their significance of impact on the resource, other users and dependent ecosystems. The States will need to define these separately.

Score: 8

Recommendation 9:

The full cost of groundwater management should be identified by the States. The cost of direct management activities should be recovered from users and within the context of the overall water cycle, appropriate apportionment of indirect costs be given consideration. Outside urban water supplies, the remaining subsidies should be transparent where full cost recovery is not achievable. The necessary charges should be implemented progressively by 2001, and particular attention should be given to timely resolution where, and as trading in groundwater is likely to be demanded by the market. Public communication on these matters will be important.

With reference to Recommendation 3, States should give consideration to the consequences of differential pricing between surface and groundwater.

States should examine the means for meeting the indirect costs of groundwater management, including investigations which are not appropriately apportioned to users; options may include a direct but transparent subsidy. Recovery of management costs from domestic and stock well owners is to be considered by the States as part of their overall cost recovery strategy.

Score: 1

Recommendation 10:

The Federal Government should publicly identify its full costs of involvement in groundwater activities to assist in the negotiation of priorities for Commonwealth funding of groundwater management activities.

Score: 1

Recommendation 11:

State and Federal agencies should develop and implement organisational arrangements and processes which specifically eliminate conflict of interest situations in groundwater assessment and management.

Score: 7

Recommendation 12:

SCARM should assess the opportunities for increasing public awareness of the value of groundwater, its vulnerability to over use and damage through other activities and the need for groundwater management as key issues and encourage the States to develop appropriate awareness programs.

Score: 3

The review above demonstrates that there was a poor performance overall against these recommendations in 2000. Since then many States have further progressed with the redrafting of groundwater laws and

policies and many are introducing charges for groundwater that reflect management costs ie NSW and Victoria.

5. SUMMARY AND CONCLUSIONS

Groundwater has been the Cinderella of Australian water laws, policies and institutions for period of white settlement. It has been looked at last and only in response to a regional crises in Victoria and the Great Artesian Basin. (See Box 1 and Box 2.) Governments have responded to these crises by reductions in allocations table 3 but only after detailed community consultation.

The wholesale transfer of the common law of England to Australia was the initial start of the problem (See table 2) as this allowed for exhaustion by each landowner. This mentality created the tragedy of the common in some areas (See table 4). The vesting provisions of the period from 1869 onwards were also a problem (See Table 3). The vesting power to use and control groundwater was given a very permissive interpretation in each state, perhaps harking back to the common law. So allocations were given freely, with no charge for the water and bores were sunk and allowed to flow unrestrained.

This resulted in chronic over draw problems in some places and ad hoc policies to deal with local problems (See Table 4).

Table 5 looks at the key points of the regime dimensions in Australia and the coherence between groundwater and surface water laws.

The trend is towards the inclusion of the fullest EDS so a broad coverage as the Commonwealth policy on ESD requires. The coherence between laws for surface and groundwater remains a problem. The regime dimensions have become multi purpose. The question remains as to how to achieve multi purposes as required by ESD in a coherent manner in regions with vastly different surface and groundwater problems.

Table 5 Coverage of and coherence between laws creating institutional actors in rural water governance regimes in Australia

Regime dimensions	Coherence between laws for groundwater and surface water		
	Low	Medium	High
Coverage single purpose agricultural development	Simple informal regime based on cultural norms all states up to 1896	Simple formal regimes Australia 1800 to 1850 Victoria 1969	Simple formal regime Australia 1850 -1960
Coverage adds in another purpose as reactive to an event	Simple formal regime Fragmented	1970 + simple formal regimes fragmented	Simpler regime fragmented
High coverage limited ESD	Complex regime fragmented 1995+	Complex regime Fragmented New 2005,	Complex regime integrated Great artesian basin scheme Qld 2002
fullest ESD multi-purpose	Complex regime fragmented	Complex regime Integrated	Complex regime integrate Sa. 2005

Adapted from Kuks 2004

Australia is experimenting with 8 approaches to achieving ESD in complex surface and groundwater problems. The key may be to revise the laws to create a specialist type of water institutions that collects water use data, and reviews the water demands. These bodies may well be constituted at the regional level. The new type of institution would need to be high in the administrative hierarchy of each State and be able to make decisions or influence land use decisions of their bodies based on a mission statement to allow only sustainable development.

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