RESEARCH PAPERS

Managing Climate Variability in Australia, South Africa, United States and Spain

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Abstract

This report describes the first stage of a project that is comparing water governance in southern Australia, South Africa, south-west USA and Spain. The river systems examined are subject to highly variable climates and have a long history of drought management. Underlying assumptions are that the stress of drought reveals strengths and weaknesses in institutional systems that are often hidden in wetter times and that the way a given management system responds to drought is a good indication of how it will respond to climate change. This is a study of the past to prepare for the future. The report also outlines a proposed governance evaluation framework which focuses in particular on the impact of federal political systems. The capacity to manage large rivers that cross borders within federal systems is almost invariably at threat from ongoing intergovernmental and interagency conflict, low decision making transparency and accountability, high transaction costs and ad hoc deals between competing governments, and between them and powerful stakeholders. The aim of the evaluation framework – as it develops over the course of the project – will be to highlight transaction costs and governance features that work well. The river catchments investigated by this project are all in the midst of major water reform programs, albeit with different aims under different circumstances. The report makes some tentative comments about the way these reform programs are progressing.

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Introduction

This project started as a comparison of drought management and preparations for climate change in four regions of the world with similar variable climates but different institutional systems. The four regions are southern Australia, southern Africa, south-west USA and the Mediterranean rim (with a focus on Spain). The aim was to use the comparative process to provide insights that can be used to improve the governance of large hydrological systems. Over the course of the project the emphasis changed. Initially the focus was on the four geographical areas. Increasingly, however, it shifted to a slightly different theme – how best to compare them. The aim is to garner ideas that can be used to improve water management, both in Australia and elsewhere. That focuses attention on the question – what is the best way to organise the vast array of information to support useful recommendations and generate new perspectives? This reformulation is the product of work on the comparisons for over eighteen months. The shift in focus emerged towards the end of the project so to some degree the information collected does not fit as neatly as it would have if the evolution of the project had been known in advance. However, it has been a productive journey.

How should we compare?

Through the course of the project a number of different criteria were considered at different stages for use in the comparative template to be applied to the four case studies. As it became refined the aim of the *Drought Past and Future* project has been to make comparisons between different river management systems that focus not so much on defining desirable outcomes but rather on defining the types of management behaviour that produce such outcomes. No person sets out to design a water management system that will fail but all the systems examined in this project are struggling to reverse ongoing decline. Water management systems are designed within contested political environments in which competing interests have to be mollified. The results reflect the deals required to get agreement. One of the aims of the comparative approach taken by the project is to heighten awareness of transaction costs and potential causes of institutional inefficiency so as to increase the pressure to reduce them. The phrase ‘dynamic characteristics auditing’ is used to describe this approach.

The selected themes are the capacity to:-

1. manage across borders
2. respond expeditiously to crisis
3. base policy on good science
4. integrate planning/management with wider planning/management processes
5. negotiate between competing issues
6. achieve compliance
7. adapt to novel and emerging issues

Sources of risk

Implementing a whole-of-systems approach that can take comprehensive account of the full range of issues that shape outcomes and potentially create risk is easier said than done. Some indication of what is involved is provided by a list of characteristics typical of environmental policy issues such as water management, compiled by the policy analyst Stephen Dovers. He argues that they make environmental sustainability problems fundamentally different from other policy issues. They occur over much longer time scales and often cut across established administrative boundaries. Poorly defined but finite limits are common but it is difficult to take them into account within economic systems committed to the reducing restraints on short-term growth. Environmental systems are frequently subject to thresholds that result in significant loss when they occur but which are hard to predict and difficult to reverse. There is great uncertainty about the likely effects of policy choices when the costs and benefits can be very long term. Many impacts are cumulative and interact with each other and long established patterns of management can suddenly produce very different results compared with the past. Even more problematic, as the level of development pressure grows, it is difficult to take account of ethical and moral considerations created by the conflicting demands of different sections of society.

The sheer novelty of sustainability problems makes them difficult to handle within traditional modes of management. For political parties, contemporary water management create divisions that ignore traditional party lines. Robust criteria for determining whether the costs and benefits of particular water policy issues should be treated as public or private are hard to develop. A significant underlying factor fuelling the growing crisis is that the predictive capacity of traditional science continues to be limited. Trends and general bio-physical processes can be documented at the larger scale but it is often difficult to identify the links between particular actions and specific consequences with enough certainty to give managers, the courts and the people who will be affected by their decisions, confidence in the assessment process or the results.

There is also a low capacity to organize the economic system to penalize those who are responsible for negative environmental impacts or provide rewards to those who incur extra costs by adopting more sustainable management practices. Despite the growing interest in so-called triple bottom line accounting, management systems are ineffective in capturing the environmental/social costs and benefits involved. Further, the legal system is frequently unable to penalize those people responsible for negative environmental impacts and the potential benefactors of remedial action often cannot be identified clearly enough to target the collection of costs.

Efforts to consider these questions are further complicated by the range of actors influencing policy and management in different ways. The Murray-Darling Basin can be used as an example to illustrate the complexity. While unique in some ways it also has many similarities with other major hydrological systems. Much of the discussion about inter-jurisdictional water management in the MDB gives the misleading impression that interaction between the Commonwealth and state levels is highly structured but the reality is much more elusive. The independent centres of sovereign power provided by the Commonwealth and state jurisdictions create focal points around which contending interest groups arrange themselves, moving from one to the

other as their members make strategic decisions about alliances and about how best to promote their goals or block those of others.

In practice, decisions are not made through a top-down process but are the product of complex cycles of interaction in which the participants have varying degrees of influence but no single voice is dominant. Policy development and management in the MDB now involves complicated ongoing negotiations between a large number of individuals, groups, organisations and institutions including governments. The Commonwealth government supplies the bulk of project funds to a variety of recipients but usually has to rely on indirect processes of accountability to influence implementation. States have substantial direct regulatory power but limited funds. The new regional catchment organisations were created by state legislation and are formally subordinate to state governments but they have independent corporate standing, sometimes get Commonwealth funding and have ready access to state and federal parliamentarians representing their areas. Research bodies and research and development corporations are frequently marginal but periodically provide findings that can bolster some positions in public controversies, discredit others and sometimes shift the basic assumptions upon which such debates are conducted.

Even more politically active are the industry bodies and large companies emerging as irrigation based agriculture becomes more business orientated. There are also non-government organizations such as the Australian Farmers Federation and the Australian Conservation Foundation that influence the wider electorate and whose support is needed by both federal and state governments for major initiatives. In addition, local governments, although largely ignored by policy makers involved with environmental issues, have planning powers that can play a decisive role at the district level. Largely excluded from all these interactions are members of the general community. They tend to be involved only very intermittently but when activated in the mass can be a decisive and unpredictable political force.

Large hydrological systems are treated as open resources

As a result of factors partially listed above large hydrological systems that cross borders are highly exposed to the risks attached to what are known as open resources. In 1968 Garrett Hardin published a short paper titled *The Tragedy of the Commons* in which he argued that it was difficult to restrain over exploitation of common resources such as shared pastures, fish and water¹. Critics subsequently nominated many examples of successful management of natural resource systems owned in common and suggested that his thesis was more applicable to open access resources which lack any effective overarching institutional framework able to control and regulate the behaviour of would-be users as a group. In the case of an open access resource it is in the interests of each individual user to expand their own consumption indefinitely because any restraint will only increase the volume available for their competitors. The eventual result is the complete destruction of the resource to the disadvantage of everybody. That is the fate currently being experienced by most large international hydrological systems. The Dynamic Characteristics Auditing approach being developed through this project aims to capture and highlight as many of these

¹ Hardin, G., 1968, 'The Tragedy of the Commons'.

risks as possible by focusing on key areas of activity where they might be influential. By tracing back from the dynamic characteristic in question the different factors shaping outcomes can be identified – that at least is the aim.

Most auditing systems

It is common for water governance assessment and auditing systems to start by working out what features and characteristics are needed for effective management and then investigate whether or not a given system has them. A good example of this approach is provided by Bruce Hooper in his introduction to the special issue on *Integrated Water Resource Management – New Governance Tools and Challenges* published in the Journal of Contemporary Water Research and Education in December 2006. Hooper lists twenty benchmarks of ‘mature, auto-adaptive river basin organisations implementing effective integrated river basin management’.

Decision making

- 1 Decision making by the river basin organisation occurs within a national framework of natural resources management objectives and investments
- 2 Decision making is consensual and coordinates across sectors in the basin
- 3 Decision making is reflected in the river basin’s organisations business plan, is prioritized, focuses on efficiency, links vertically to governments and provides stakeholder access to government

Goals, Goal Shift and Goal Completion

- 4 An IWRM approach is agreed to and practiced by the basin organisation
- 5 Objectives are specified in and articulated through feasible options in a river basin management plan

Financing

- 6 River basin management is financed through cost sharing
- 7 Financing is on-going, guaranteed, adequate, linked to national and state priorities
- 8 Ex-ante and ex-post economic assessments of management are practiced
- 9 Water pricing and alternative demand management are practiced

River Basin Commission Functions

- 10 Stable democratic conventions exist to provide stability to the institutional setting
- 11 The river basin organisation’s functions are co-ordination driven and realistic

Law

- 12 Ongoing laws exist to enact natural resources management relevant to basin management
- 13 The roles and responsibilities of the river basin organisation are clearly specified in both national water policy and law

Staff Training

- 14 The river basin organisation has a program in place to improve staff quality for management skills, leadership and communication

Information and Monitoring

- 15 the river basin organisation has its own, or joint access to, well developed, accurate, up-to-date, information and monitoring system
- 16 Science informs the river basin organisation through modelling and spatial representations of options, which are costed and linked to the river basin

- organisation's decision system, options which are delivered through strategic planning and decision-making processes
- 17 The information management system reports on how the basin is being managed and resources are consumed and protected

Coordinated Management with Stakeholders

- 18 Public involvement processes are effective, providing for joint decision making and conflict resolution
- 19 The roles and responsibilities of stakeholders are specified and understood
- 20 The river basin organisation uses joint ventures and coordinates strategic decisions between partners.

This is a very useful list and an excellent guide for anyone setting up such an organisation or reforming an existing one. However it is clearly built on a number of cultural values that are not universal. Many of the benchmarks explicitly or implicitly promote pluralist, participatory, democratic values. It may be that this is the only way to manage a river basin successfully but should that be assumed? Dynamic Characteristics Auditing is an attempt to step back and begin the discussion about water governance reform at a more basic level with fewer assumptions about what should be done.

Dynamic Characteristics Auditing

Dynamic Characteristics Auditing highlight key areas of activity that create risk for water management. The type of questions that it asks are meant to focus attention on what is happening in these areas of activity in a way that is as neutral as possible about suitable remedies. Dynamic Characteristics Auditing is an attempt to separate analysis of what happens from proposals for reform. It is argued in this paper that it is only by going through the two processes in sequence with a degree of separation between them that a water reformer can be confident that awareness of a range of possible remedies is not distorting understanding of the original situation (To state the proposition in a colloquial form the aim is to avoid seeing every problem as some sort of nail because one happens to have a hammer.)

Why drought?

Extreme events such as drought reveal the strengths and weaknesses of water management systems in ways that are often obscured in less stressful times. Technical, organizational and systemic capacities and constraints, political priorities and fundamental cultural values shaping society-wide thinking about appropriate goals and methods for managing such crisis, are most evident when difficult and contentious policies have to be implemented and choices made between competing demands. Pressure from drought strips away the rhetoric of the water management vision statements and exposes underlying priorities, strengths and weaknesses. This gives a useful indication of how water managers will confront climate change in the future. During the next few years the process of adapting to take account of climate change will draw heavily on previous experience with the management of droughts. Consequently it is imperative that the strengths and weaknesses of existing policy and practice be thoroughly understood.

Even though the societies being considered in this study have long histories of interaction with droughts established responses are not invariably positive. Adaptations to climate variability are often contradictory reflecting the conflicting goals and demands of different stakeholder groups. In many cases resistance or defiance has been more dominant than the intention to creatively adapt. A study of drought management is a useful starting point to gain greater understanding of these tensions.

Why drought in large river basins in federal systems?

One of the constants of river management is the pull between centralisation and decentralisation. Some issues need to be managed centrally to get consistency across the catchment and ensure that costs and benefits are assessed and managed from a whole-of-system perspective. Others need to be devolved to the local level so that managers can take account of biophysical variety and the social and economic interests of the people who will be most affected by their decisions. This project focuses on one part of that spectrum - large rivers in federal political systems - in between small hydrological systems where unitary management is possible (ie a small stream in a unitary political system such as England) and international rivers such as the Euphrates or the Mekong. The thinking is that large rivers within a single federal system have many of the characteristics of the latter but should have greater potential for achieving a coordinated result, given the existence of an overarching political framework.

Rivers and groundwater systems within federations divided between states and provinces provide the essential water supply for much of the population living in Australia, the United States, Europe, China, India and many other countries. (For the purposes of water management Europe now operates as a single united federation with the links between the central and national governments at least as strong as in many of the other federations under discussion.) Most large hydrological systems have declining environmental conditions and supply security. A major cause is incomplete institutional coverage of key issues, in part due to the arbitrary division of catchments into competing jurisdictions within these political systems. The geographical and organizational division of roles and responsibilities needed to manage water effectively frequently does not match the established division of administrative roles and responsibilities. This often reduces the capacity of water governance systems to develop a coordinated response to the issues that threaten their environmental condition and resource security.

Typically the management of large cross-border rivers and groundwater aquifers in federal political systems is characterized by considerable intergovernmental and interagency conflict, low decision making transparency and accountability, high transaction costs and ad hoc deals between competing sub-national governments that undermine best practice water management. When water managers are responsible for only part of a catchment they are under pressure to favour the section for which they are accountable. This encourages them to export the costs of pollution or water shortages across borders wherever possible. Cost benefit analysis is often conducted from the perspective of each sub-basin and not that of the whole biophysical region.

Polluting industries are placed near downstream borders, economic activities of marginal benefit within-border are given preference over economic activities of much greater overall benefit on the other side of borders etc. In these decentralized systems data collection is primarily organized a sub-basin perspective, often with different units of measurement and auditing approaches compared with neighbouring units. This makes comparisons and whole-of-basin aggregations very difficult. An auditing framework focussed on dynamic characteristics would highlight the costs of these factors and be a useful addition to the range of other assessment frameworks being developed to promote water management reform.

Key points

- Drought reveals strengths and weaknesses of institutional systems which are often disguised when water is not in short supply.
- The established practices by which societies manage droughts will shape the way in which they respond to climate change.
- Intergovernmental relations and the competing foci of political power created by the involvement of different layers of government are zones of high risk for water management systems.
- Cultural values defining what is regarded as good or bad, reasonable or unreasonable, are a crucial element determining what is possible and what is impossible for water governance reform.
- Australia is struggling to implement high quality water reform because the program is not understood or supported by key stakeholder groups or the wider public.
- Equity and justice issues have the capacity to overwhelm other priorities if not dealt with effectively. Conversely, managed well they provide a solid foundation for long-term arrangements (note Lake Victoria in Australia).
- The existence of a strong legal framework with significant penalties can be a powerful inducement for stakeholders to negotiate with serious intent to avoid the courts.
- The European Union's *Water Framework Directive* assigns a much higher priority to public participation and cultural change as sources of energy to drive fundamental water reform than do Australian governments.
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South-west USA

One of the most important hydrological systems in the south-west of the United States is the lower Colorado basin. It supplies water and electrical power to approximately 30 million people in seven states, Utah, Wyoming, Colorado New Mexico, Arizona, Nevada and California (and north-east Mexico where the river used to reach the sea). As a river with a highly variable flow whose management involves a number of states and the federal government it has often been compared with the Murray-Darling Basin. For management purposes the system is divided into the upper and lower Colorado Basins. The two have very different institutional regimes. The upper Colorado supplies most of the water and its member states use a 'proportions of available flow' approach to share what is left after commitments to the lower basin have been met. The lower basin states are much less coordinated and very competitive. They have volumetric allocations whose seniority is ranked according to when they started developing and the many court cases that they have litigated with each other.

The recent and continuing drought on the Colorado system has been the most extreme since records began to be kept in 1906. As such it has highlighted a dilemma that has been of concern for a long time. The flow of the Colorado is allocated volumetrically and the total of allocations is now known to be larger than the long-term average flow. This was not an problem until recent years because only California was using its full allocation. However it was long expected to be a problem and that anticipation resulted in a long series of legal battles during the course of the 20th century. Fuelling the fears of those states that were developing at a slower pace than California was the law of prior appropriation that dominates legal questions about water in the western United States. Often summarized as 'first in time first in right' the prior appropriation doctrine caused other states in the Colorado basin to fear that California would acquire a right to a very large proportion of the river's flow by using it first. The six other states would then not be able to draw from the river because they would be reducing the volumes required to supply California's more senior right.

The seven states met in 1922 and the resulting Compact divided the Colorado into two sub units, the upper and lower basins. The Compact apportioned the first 15 million acre feet (MAF) of annual flow equally between the upper and lower basins and gave the lower states access to an extra one million MAF for additional development. (One MAF equals 1233 ggalitres) Should there be a shortfall the lower basin has priority. Subsequently it was agreed that Mexico would receive 1.5 MAF at no more than 700 parts per million salinity level either from surplus flows or equally from the allocations to the upper and lower basins. Arizona contested this agreement in a long series of court cases that culminated in victory of sorts in 1963. That capped California's share at 4.4 MAF. Subsequently Arizona agreed that its rights would be

junior to those of California in return for federal funding for a massive delivery system known as the Central Arizona Project.

More recently other legislation such as the Endangered Species Act in 1973 has been added to the body of law and legislation that shapes management of the river. Among other things the Endangered Species Act prohibits the ‘taking’ of a threatened or endangered species that is broadly defined to include habitat modification that threatens the species. Other relevant legislation includes the Grand Canyon Protection Act which is meant to reduce the impacts on the river of releases from Lake Powell.

1. The capacity to manage across borders

In practice each of the lower Colorado basin states manages its water autonomously with minimal coordination with other states. Most dispute resolution procedures for the lower Colorado basin are centred on the powers of the federal Secretary for the Interior. The 1963 decision which limited California’s share to 4.4 MAF also gave great powers to the Secretary of the Interior to adjudicate disputes. These powers were made more specific by legislation in 1968 that appointed the Secretary the Supreme Court’s water marshal and gave him or her the powers to develop a regional plan for apportioning water between the states. In addition, the Bureau of Reclamation is also included within the responsibilities of the Secretary of the Interior. This gives the Secretary control of most of the major dams in the upper basin.

The recent history of water management on the Colorado is a study in the way in which courts, political bodies, water managers, major stakeholders and the general public interact and affect outcomes for hydrological systems. On the face of it the Secretary for the Dept of Interior has the authority to make major changes to improve water management but the various occupants of that office have clearly been reluctant to do so. One possible explanation is that they have all felt that they could only do so with strong community support, something that has been lacking until the recent drought. This points to the importance of culture change to support a more integrated and coordinated approach in the lower Colorado basin.

The recent history of water management in the lower Colorado provides an interesting example of the way in which legal systems and administrative systems can constructively interact together. To some degree the prospect of an unpredictable court decision encourages state governments to negotiate. If each of them feels that they could loose as a result of a judge’s decision the pressure is on to come to an agreement outside of the court system. In 2005 the Secretary of the Interior announced that she would unilaterally develop new guidelines to deal with extreme drought if the lower Colorado states did not prepare them themselves. This caused the seven states to make modest but unprecedented changes to what has long been seen as a highly inflexible management system. These events point to the intriguing possibility that stronger federal powers could reduce the need for federal intervention in practice.

There are a number of other features of the situation in the Colorado that also encourage this response to the prospect of a court decision or the threat of federal intervention. First, trans-boundary water management in the lower Colorado is mainly

about the distribution of water and is not as ambitious in its range of concerns as the European Water Framework Directive or the MDB's Basin Plan. Decisions are about clearly defined, specific choices – more water for one state less for another – rather than complex adaptive management regimes that require ongoing negotiation and interaction. This makes it easier for a United States court or the federal government to intervene decisively and then withdraw from close involvement. Second, most of the water distributed to the lower basin states - whose demands and disputes have dominated the history of water management on the Colorado - flows from the upper basin into two large storages controlled by the Bureau of Reclamation a federal agency. In other words there are key control points that are beyond the reach of state governments through which the federal government can exert pressure or act unilaterally. This is different from the situation in the MDB where the Commonwealth is attempting to influence water management conducted within states by officials who are less directly dependent on federal approval or resources. Finally there is the subtle influence of numbers, although it is hard to define just how this influences events, relations between a federal government and state governments are likely to be different when there are 50 states as opposed to six as in Australia.

2. The capacity to respond expeditiously to crisis

When the drought in the south-west USA began in 2000 the two major storages on the river were at 95% capacity. By 2004 this was down to 46%. The draw down had allowed all allocations in the lower basin to be met but it was a strategy that could not be used a second time if the drought continued or recurred before the storages had been substantially refilled. In response to the threat to intervene made by the Secretary for the Interior in 2005 the states came together with the Bureau of Reclamation to develop new guidelines that were adopted in 2007.

Of particular concern was the impact on junior rights holders such as Nevada and Arizona. Under the prior appropriation doctrine in its purest form they would have been very hard hit by another severe drought. Unless modified the prior appropriation doctrine requires that more senior rights be satisfied in full before junior rights can have any access at all. Nevada and Arizona are new states heavily dependent on the Colorado and have junior rights compared with California (where most of the Colorado water is used for irrigation in Imperial Valley much of it of low added value) so the arrangement previously in place would have had very perverse outcomes in terms of public policy and economic development. In addition to the short-term impacts of severe water cuts it is likely that future investment and plans for expansion would have been severely curtailed if new guidelines were not developed. The preparation of the new guidelines also allowed the states to take account of a number of environmental priorities.

Core to the guidelines was agreement to changes to the sharing arrangements between the states that would be triggered by different water levels in lakes Powell and Mead and long range forecasts by the National Weather Service. The greatest significance of these new guidelines, however, is not the size of the changes, which are relatively modest in the context of the total volumes distributed in the lower Colorado basin, but in the principles that underpin them. These show the beginnings of recognition of the legitimacy of public policy priorities as a driver that should shape water management

arrangements. The episode also showed that the states are willing to negotiate to avoid the courts, a significant break with past practice in the western United States. If the predictions being made for climate change are generally correct, however, much greater changes to the sharing principles will need to be made in the future if the south-west of the United States is to adapt in ways that will protect existing investment let alone maintain the rates of growth that have marked recent decades. Review of the guidelines and reassessment of the general situation is set to occur in 2020 although circumstances may require further adjustment sooner than that.

3. The capacity to base policy on good science

Policy makers and managers working on the lower Colorado basin have access to extraordinary scientific resources. Certain technical and engineering tasks are world's best practice. However the lower Colorado basin management framework has very limited objectives. These include some environmental goals but they are mainly confined to water sharing and distribution. In essence the region lacks a comprehensive approach to water management that would be required to deal effectively with the full range of issues defined as part of water management by the international water management literature. In addition it appears that long term monitoring systems are very limited in their collecting points and the types of data that they bring together. There is also a strong objection in many parts of society in the south-west to collecting and supplying data that could be used by governments to strengthen their regulatory systems.

4. The capacity to consult effectively with the wider community

Within some states such as California which is working on its next state water plan there has been a significant shift to consultation. In the period immediately preceding the last couple of decades there was a marked increase in litigation but with mixed results. Many legal decisions focused on procedural not substantive issues and efforts to avoid litigation were minimalist in their approach. With so many stakeholders thinking they could 'win' the litigious atmosphere discouraged the cooperation necessary to solve complex issues where the law was not clear which was often the case. In the recent more collaborative era the law still plays a role in that failure to agree will mean expensive protracted court proceedings with outcomes that are often hard to predict. In addition some issues such as non-point source pollution did not lend themselves to targeted legal action. In many situations a combination of education, commitments to change behaviour, and voluntary agreements to share costs and benefits along with publicity for those who do not cooperate has proved more effective.

Behind this change in approach was increasing support for collaboration from the federal Environmental Protection Agency. This included funding professional facilitators. The shift often brought together groups with very different beliefs and agendas. On the one side there was conservative discontent with federal agencies issuing edicts about federal lands. On another many researchers were frustrated by the tendency of regulatory agencies to focus on the particular issue relevant to their organisation rather than taking a holistic approach to the many social and biophysical factors whose interactions were shaping environmental outcomes. There was also

increasing interest in place-based management, many people wanted more control over their immediate environs and less direction from afar. Added to the mix was growing assertiveness on the part of Native Americans encouraged by a number of major court decisions that gave them substantial rights to a range of resources, such as fish, land and water.

These emerging collaborative institutions are marked by the use of watersheds or catchments as their organisational focus rather than political boundaries, the involvement of a wide range of stakeholders (some expert others not), reliance on face to face negotiations, commitment to finding compromises that benefit all parties and share costs equitably along with a fairly extensive exploratory phase where the wide range of stakeholders get to understand each others concerns and interests and develop a shared body of factual knowledge upon which to based future discussions.

Compared with past practice this collaborative approach has a number of novel features. To a significant degree all the stakeholders treat each other as equals even though there may be big differences in power and knowledge. Local knowledge is also given a higher status than has been usual in the past. The movement has its critics, however. Some environmental groups argue that major changes in, say, allocations to production or other reforms that will significantly impact on stakeholder interests get scant consideration in consensus-driven approaches that tends to treat all interests as equally worthy.

5. The capacity to negotiate between competing issues

The example of CALFED in central California illustrates some of the difficulties involved in coordinating competing interests. During the 1990s under the US Environmental Protection Agency's National Estuary Project a diverse group of stakeholders including developers, real estate agents, environmentalists and farmers worked cooperatively to develop a comprehensive conservation and management plan (CCMP) for the San Francisco Bay and Delta area. Amongst other factors competition for consumptive use of water and insufficient environmental flows had increased salinity levels degrading ecological and other values.

Over a five year period these groups debated, developed and adopted the CCMP that included a "set of agreed-on data on the state of the estuary and an indicator of salinity to use as a warning sign when biodiversity of the estuary was at risk due to insufficient freshwater releases." The governor of the state however did not follow the plan's recommendation and established, instead a different stakeholder advisory arrangement.

Despite disappointment of many participants, a culture of collective debate on water policy amongst government and non-government interests persisted. In ensuing years two things happened that are ascribed to the San Francisco Estuary Project (SFEP). One, the federal government adopted the salinity indicator and subsequently required the State to follow suit, resulting in the required environmental flows being released by the state. Two, the agreement seeking efforts by stakeholder representatives under the initial SFEP, along with the subsequent advisory team set up by the governor, "eventually resulted in the establishment of the CALFED Bay-Delta Program".

The CALFED program is a collaborative policy-making and water management process amongst the 23 state and federal agencies with responsibilities for managing water supply and protecting related natural resources in the Bay-Delta Area. Its history since then, however, shows how difficult it is to establish an effective presence in that institutional space. Many critics have charged that it has not fulfilled its planned go-between role. Instead it has become just another agency fighting for turf at the expense of its rivals. But the rationale and issues that prompted the establishment of CALFED continues to exist, both in California and elsewhere subject to a federal political structure.

6. The capacity to achieve compliance

There are a number of cultural features of the southwest of the USA that make it difficult to enforce strong systems of regulation and compliance. At the intergovernmental level state governments and vocal sections of their populations are much more hostile than in Australia to activities that involve the federal government in anyway beyond the supply of funds. One example of this political culture in the south-western states was the so-called ‘sage bush rebellion’ that was pivotal in the rise of Ronald Reagan. The phrase describes the populist reaction to efforts to limit ranchers’ use of public lands and to President Jimmy Carter’s attempt to rein in the rampant dam building Bureau of Reclamation in the 1980s. The strength of these ideas in popular culture is hard to appreciate without visiting the region.

A reflection of this culture is opposition to monitoring water use. This is often reflected in the concession that it be done, if at all, at very local levels with minimal data pooling. As a result many statistics about water use are estimates rather than collected data. Splintered administrative patterns are also a feature of south western USA water management. One University of California senior water researcher said to me, ‘If I prepared a recommendation for catchment based water management in the central valley of California I would not know where to send it’.

In addition water is priced very low so there is no economic pressure encouraging behaviour change or even the sense that the resource is limited. It seems that this attitude is most extreme in southern California, Nevada and Arizona and much less so in central California. The population and economic growth of the lower Colorado basin – the fastest in the USA – is based on cheap water and cheap power and there is confidence that these foundations will remain strong in the future. All in all the cultural pre-requisites needed for robust catchment management and effective systems for compliance are very weak.

In the south-west of the USA the dominant assumption seems to be that water should be found to satisfy whatever is the demand. There is not a strong system of regulation, restraint because of shortage or effective methods to ensure compliance. An example is the way in which the federal government has dealt with California’s long history of over-consumption beyond its allocated 4.4 MAF. Although clearly in breach the state has been able to use its political strength to ensure a glacial process of cutting back. An illustration of the way that pressure is being exerted by the federal Secretary of the Interior to resolve these tensions is the tangled saga of the would-be transfer of water from Imperial Valley to the city of San Diego. The story involves both effort to

reduce California's take from the Colorado and also to get water redirected to higher value uses, in this case to support a major city.

Imperial Valley has very senior water rights because it was the first major irrigation project in the lower basin. It uses nearly 80% of California's allocation from the Colorado. Its water is extremely low priced which makes it possible to make profits from low value crops such as lucerne and discourages investments in water efficiency because the value of the water saved would be much less than the cost of improvements. In addition, much of the water applied to the farms of Imperial Valley runs off with a heavy load of salt and agricultural chemicals into a nearby drainage basin known as the Salton Sea which despite its pollutant load has become an important wildlife refuge in the region. Concern about the possible drying of the Salton Sea plays a significant role in the debate.

Cities along the coast such as San Diego and Los Angeles developed more recently than irrigation areas such as Imperial Valley so they have more junior rights (As already stated senior rights must be satisfied in full before junior rights receive any water.) At the same time as California has come under increasing pressure to reduce its take from the Colorado to its 4.4 MAF entitlement, users with junior rights such as the expanding coastal cities have come under great pressure to find extra water. The most obvious source is nearby Imperial Valley where water is abundant and used inefficiently. In 2002 discussions about a possible purchase broke down because the Imperial Valley irrigators complained that they were being pressured by the negotiators from San Diego and the state government.

In response to put pressure on the irrigators the federal Secretary of the Interior Gale Norton reduced water to Imperial Valley by 11%. This was then overturned by a court judgement that concluded that federal Bureau of Reclamation had to conduct an assessment of water use in the valley first before making a reduction. In 2003 the Bureau performed the assessment, found that water use was inefficient and ordered a 9% cut. Negotiations continued and eventually state legislation was passed approving the transfer and a package of related measures to make it acceptable to Imperial Valley irrigators. As of mid 2009, however, water had not yet started to flow to San Diego and the project faces further delay caused by a legal injunction brought by residents in the Imperial Valley attempting to block the transfer on the grounds that this will increase the volume of wind-borne pollutants from those parts of the Salton Sea that would become dry if there was a water transfer to San Diego.

7. The capacity to adapt to novel and emerging issues

In practice political leaders and water managers responsible for the lower Colorado river are struggling to develop the capacity to respond effectively to the difficult future they face. The reduction in water and electricity that will result from low flows caused by climate change has serious implications for what is the fastest growing region of the United States. Since 1950 Phoenix has grown from 330,000 to 4 million and Nevada, Arizona and California are the first, second and thirteenth fastest growing states in the USA. For a hot dry region predicted to get hotter the threat to hydro-electrical generating capacity is a serious challenge given the dependence on

air conditioning and problems with alternatives such as nuclear and coal (but not solar).

Water shortage in the south west on the other hand is a problem that could be solved if the will was there. It is argued that much of the water consumed in urban areas is used for inappropriate urban landscapes and much of the 80% of lower Colorado water that goes to agriculture is used for low value crops that are only grown in the region because they are subsidized by the federal government. The volume of water that would be needed to maintain the life style of the population is far less than the volume that would be saved if those activities were eliminated. (Similar statements could be made about water use in the Murray Darling Basin.) That said, shifting from such usage patterns is very difficult.

One of the most interesting factors that complicate water management on the Colorado is the question of how to negotiate with the various Indian communities who have very large water allocations in the lower Colorado basin. There is the potential for compromises that would benefit both the Indian groups and the wider population that needs more water. Negotiating compromises is proving difficult however. For people outside the USA the situation with regard to Indian water rights in the south-west of the United States might be surprising. As a result of many court decisions over the past century they have very senior rights to large volumes of water although the exact quantities are still not defined. Using one widely recognised method of calculation their claim could exceed the entire allocation to Arizona the state where most of them live. Many systems of law come together in the south west. One of the most important is that known as prior appropriation – first in time first in right. During times of shortage this means that the more senior or oldest rights are satisfied in full and before more junior rights.

It is likely that Indian peoples would have been marginalized with few water rights if public opinion and raw democracy through the nineteenth and twentieth centuries had been the main determinant of their fate. During those times there would have been very little support in the wider general community for water for Indians at the expense of powerful non-Indian development interests. The compact worked out under the guidance of Herbert Hoover in 1922 was a significant modification to the operation of the prior appropriation doctrine to the Colorado basin but it did include the statement that ‘nothing ...shall be construed as affecting the obligations of the United States of America to Indian tribes’. For them prior appropriation continued to apply.

Indian water rights are of three types. ‘Aboriginal’ for those tribes that continue to occupy land they have held since pre-conquest times. ‘Pueblo’ rights from the Spanish period of occupation and ‘Winters’ rights in reference to a supreme court decision in 1908 that stated that their rights under the prior appropriation doctrine dated from the time of the creation of their respective reservations which predate most other water rights including those of the states of Arizona and Nevada which did not then exist. Most Indian water is held as ‘Winters’ rights. As demand pressure grows and flows become more contested, and with the prospect of reductions due to climate change, these Indian water rights are becoming highly significant for calculations of future water availability in the south-west.

In practice the rights do not exist until they have been calculated and approved by a court. The common standard is the 'practicably irrigable acreage' method that quantifies the amount of water needed to irrigate arable lands on the reservation. Very significantly, however, the courts have held that the water does not have to be used for irrigation and have allowed it to be traded to non-Indians under some circumstances. This principle has been backed up by federal legislation. Not surprisingly this issue is highly controversial in the states of the lower Colorado basin but Indian water rights have been the subject of a number of Supreme Court decisions and there is no serious suggestion that they will be significantly modified or abolished.

The management of climate change issues provides an example of the difficulty that the Bureau of Reclamation the main operator on the Colorado system has in taking account of emerging issues. It also potentially illustrates some of the risks involved in failing to do so. The Compact of the River was negotiated using data from one of the highest flow sequences of the past 450 years. It appears that the negotiators thought they were dividing up a river with an annual flow of over 17 MAF per year. Subsequently, however, detailed tree ring data has caused researchers to conclude that the long term average is about 14.6 MAF. Even more alarming is the fact that since the year 2000 flows have averaged between 10 and 11 MAF.

This problem has been compounded by the reluctance of the Bureau of Reclamation to take account of climate change predictions in its forward planning on the grounds that they are too uncertain. Its forward projections are based on the flow data since 1906 when records began. Over time this will allow some recognition of changing patterns but is a very conservative approach. Although there is significant variation in the results from climate change modelling there is a strong consensus that the Colorado basin will be hotter but not wetter. There are now a large number of climate change models for the region. Collectively they predict declines in runoff of between 10% and 30%.

Since 2000 the Colorado has had only 60% of long-term flow. In itself this does not necessarily indicate climate change. There have been extended periods in the past 1000 years when flow rates have been similar or less. The extent of the decline in flows in the recent drought is partly the result of higher temperatures. The droughts of the 1950s and 1970s occurred with average temperatures about 2 degrees Fahrenheit less than today. Higher temperatures increase evaporation, transpiration, absorption and reduce runoff. Evaporation and transpiration are significant factors. Between 1950 and 2000 precipitation over the Colorado basin averaged 354 MAF but 87% of that evaporated or transpired. If precipitation remains constant while evaporation increases by 2% runoff decreases by 14%. If precipitation declines by 1% as well then runoff falls by 22%.

Other factors affecting the condition of the Colorado Basin are also being impacted by climate change. Since 1986 six times as many acres being burnt by wildfires each year. The length of the fire season has increased by two months and the average duration of major fires has increased from 7.5 to 37 days. This has been attributed to longer hotter summers and shorter periods during which the snow pack prevents drying off. Compounding this is increased activity by bark beetles also made possible by warmer temperatures. Further north in some Canadian forests bark beetles now

cause more tree loss than either logging or fires. Conditions in the Colorado catchment are becoming progressively more difficult. By contrast with the Bureau of Reclamation the National Academy of Sciences concluded in its publication *Colorado River Basin management: Evaluating and Adjusting to Hydroclimatic Variability* that ‘the combination of limited Colorado River water supplies, rapidly increasing populations and water demands, warmer regional temperatures and the spectre of recurrent drought point to a future in which the potential for conflict among existing and prospective new users will prove endemic’.

It has been argued by authors such as James Lawrence Powell that the Bureau’s two dams policy – Lake Powell and Lake Mead – is in serious question if the long term average of 14.6 MAF and a further 10% decline in flow from climate change are accepted as serious possibilities. Under those conditions it will not be possible to fill both storages sufficiently to maintain them as major sources of water and electricity. Given the workings of the compact of the River that means that Lake Powell would be sacrificed to maintain Lake Mead potentially causing the former to reach dead pool level, never or very rarely to refill, in one or two decades. This would significantly reduce the capacity of the upper Colorado basin states to manage climate change variability by averaging releases to the lower basin.

The ‘Colorado project’ is an example of policy driven science and engineering which has been struggling ever since it first got under way to compensate for a massive starting mistake about how much water was available to share and a failure to understand just how variable flow has been and will be over time. Over the past century very large social and economic dependencies have developed in defiance of the growing evidence of what is really available. Other issues include silt build up especially in Lake Powell. The Colorado carries one of the highest silt loads of all the world’s rivers (exceeded by only a few such as the Yellow River). Each year approximately 37,000 acre feet is deposited in the lake at the head of the dam where flows slow down and deposit their load many kilometres from the dam wall the point where flows would have sufficient energy to flush it out.

Europe Union (Spain)

The goal of the European Union's *Water Framework Directive* is that all major hydrological systems in the EU should be restored to high ecological status by 2015. The unit for policy and management is the river basin and with its emphasis on the need to manage across both political and institutional boundaries it has many similarities with Australia's National Water Initiative's whole-of-hydrological system approach. Central to the WFD is an emphasis on public participation and the role of civil society. In broad terms there are three ways to implement change, by force and negotiation under coercion at the direction of governments, through trade (the market) or through deliberation, education and collaboration. The Europeans are using all three but they place a very strong emphasis on the potential of the third element known under the catch all term 'social learning' or 'sustainability learning'.

The social learning approach of the EU aims to promote cooperative behaviour and new attitudes to the environment. Its purpose is not just to solve particular technical problems and achieve specific policy goals. People are encouraged to meet often in constructive circumstances in order to develop positive relationships that can then influence the way in which they work together on water management problems. Governments are pushed to involve stakeholders early in the planning process and provide substantial support to their joint activities. The list of objectives is impressive (although there is no doubt that the reality even in the best examples is usually far short of the aim).

As part of the effort to promote public participation the European Union organised the HarmoniCOP project completed in 2008 to provide member countries with detailed guidelines for implementation backed by extensive research. The project produced a number of major reports. The Integration report states that four issues were central to the investigation:

- the need for structural change to water management institutions to create positive conditions for social learning
- the importance of the cultural factors that shape behaviour and understanding of the interactions between people, water and the larger environment
- the central role of education and effective communications and
- the need to see social learning as a key element of a wide range of processes involved in learning how to live and work sustainably.

The EU program stresses the need to build on established processes and existing networks 'rather than debunking them and trying to create alternative new ones'. Working within existing systems increases the potential to integrate the new with the old and increases the likelihood that the reforms will be accepted as legitimate. At the same the need to document what is being done is also stressed so that different regions can learn from each others experiences. It is emphasized that social learning for river basin management should not be viewed in isolation rather it should be seen as part of a much wider social movement. At the same time the report warns that many of the constraints on social or sustainability learning are structural and deeply

cultural and that change will need to be more profound than what can be achieved directly by governments using command and control methods.

Central to the HarmoniCOP project is detailed analysis of nine river basins in nine countries available on the project's website. They concluded with a list of recommendations and conclusions of general relevance in Europe and beyond. First is an emphasis on the importance of context. Implementation in any particular place needs to be based on a detailed understanding of its specifics. It is necessary to have a wide understanding of options which can be gained from the literature and knowledge of efforts elsewhere, but this should be subsumed into plans that are highly sensitive to place. The importance of leaders and facilitators is another major theme. For a project to achieve success it is essential that it be built around key organisers who are highly motivated, technically competent and committed. The role of these people in building trust and alliances and negotiating conflicts between stakeholders is crucial. At the same time it should be accepted that there will be turnover in personnel. The answer to that risk however is not to build standard operational models designed to be useful in all circumstances but rather to promote capacity building in depth.

Working to reduce transaction costs and lengthy procedures is another imperative. Involvement fatigue is a particularly significant threat given the reliance on volunteers. Australian experience with community projects supports this finding. It is also important to learn from crisis for future work. This requires a systematic approach to reflection and analysis as part of an adaptive management cycle. This is so obvious that it seems unnecessary to note it but in practice it is done rarely. Another apparently obvious recommendation is the need for a well thought through understanding of the purpose of stakeholder involvement in each particular situation. Observing a generic requirement to include public participation in the implementation process is not enough to make it useful or effective. Related to this is the importance of understanding the great variety of backgrounds, knowledge and reasons why different groups are willing to take part. The need to engage key stakeholders such as large agencies that can bring in resources and wider perspectives is also stressed.

The research of the EU into implementation issues is of particular relevance because of the great variety of governance arrangements within which the WFD is being applied. This element of the EU approach is particularly interesting for Australia because the emphasis on culture change, education and public participation has been much less in this country. Compared with Europe water reform in Australia has been more a technical managerial exercise rather than a cultural project.

Spain

The long established paradigm that shaped Spanish water management for over a century is being undermined but it has yet been replaced. Sometimes called the hydraulic mission it is broadly similar to the nation building project of Australians like Alfred Deakin and Americans such as Elwood Mead although the forces behind it were rather different. Water policy was the product of a powerful cocktail in the late nineteenth century when Spain was losing the last of its colonial empire while other European powers were consolidating theirs. The capture of Puerto Rico, Cuba and the Philippines by the United States in 1898 was a massive blow to national confidence.

A central part of the response was the dream that Spain could revive and modernize itself by a series of large scale water transfer projects that would redress the so called hydrologic in-balance between wet and dry parts of the country. The hydraulic mission brought together technocrats, administrators and politicians from both left and right. It was seen as a way of deflecting radical political elements such as left wing anarchists and extreme right wing conservatives. This perspective was adopted with enthusiasm by Franco and the Falange Party after the civil war to such an extent that large scale water infrastructure are still widely seen as ‘fascist’ in inspiration.

Although it is still dominant in practice, in principle, for reasons that are similar to those operating in many western countries, this approach has become discredited. Prominent among the advocates of change in Spain is the New Water Culture movement. This is a reaction against the authoritarian technocratic approach that still dominates water management. The title refers both to the cultural significance of water and the need for a new more democratic style of water management. The movement emphasizes links with wider discourses about ecology, sustainability, environmental justice, poverty reduction and aesthetics and is growing in influence, not least because of the similarity of many of its goals to those of the EU’s Water Framework Directive.

1. The capacity to manage across borders

Spanish catchment authorities long pre-date the current 1978 constitution that gave very substantial powers to the 17 autonomous regions (ie states or provinces). Consequently the catchments cut across the borders of the autonomous regions – the Ebro Catchment Authority includes parts of nine of them – and statistical information and other data is not collected for divisions matching their boundaries. However the autonomous regions are strongly represented in the various organs of the catchment authorities and consultation with relevant political units within catchments is strongly encouraged by the EU WFD. Despite the lack of formal recognition of the validity of regional borders transfers between catchments are now rare and even within catchments transfers from one autonomous region to another usually encounters strong opposition. It may well be that there is likely to be more success negotiating across the Portuguese Spanish border than there is likely to be between autonomous regions within Spain.

A major source of influence from outside is the EUs Common Agricultural Policy which has in the past provided incentives for agricultural activity which would not otherwise have occurred. In the absence of strong policies restraining demand this has resulted in much greater rates of water use and widespread illegal groundwater extraction in catchments such as the upper Guadiana. In more recent years, however, there have been increasing efforts to link CAP payments to compliance with other policies dealing with environmental and water quality standards such as the EUs policies regarding nitrates in drinking water.

2. The capacity to respond expeditiously to crisis

Spain’s water managers have a long history of managing droughts and floods but a more uncertain record of adaptation to other crisis particularly when they are less obvious and immediately pressing such as climate change or the loss of Ramsar sites

through incremental uncontrolled extraction growth. The response to droughts combines the strong authoritarian administrative tradition that has long dominated public life in that country, the tradition of working through established water user groups some of which have had a continuous existence for a number of centuries, and engineering responses which range from elaborate decision support systems, building dams and the construction of desalinization plants. Dealing with other forms of crisis that require demand management and the capacity to make choices between alternatives uses has proved more difficult.

Spain's technological/managerial approach to drought focuses on disputes about definitions, monitoring, decision-support systems and supply side management. Drought is a major policy concern. The economic cost of drought over the past couple of decades is estimated to be about five times that of the United States over the same period. There are strong pressures from powerful interests to treat drought as exceptional and deserving of compensation. Against this there is a dissenting tradition, represented in Spain by NGOs such as WWF among many others, which argues that drought should be seen as a predictable part of the variable climate cycle and planned for as a normal event. This would focus attention on demand side management, adaptation, environmental/sustainability issues and the importance of robust water planning and management able to take account of the interests of a much wider range of users. Influencing the debate is the proposition that national governments and the EU will provide compensation for exceptional circumstances but not for events that are part of the predictable pattern. This discourages the acceptance of drought as 'normal'. Looming is the prospect of climate change with potentially calamitous impacts. The policy treatment of drought is likely to be copied for managing climate change and so major debates are likely as the cost of drought protection escalates.

3. The capacity to base policy on good science

A certain type of science fits comfortably into the Spanish techno/administrative model of water management. The place of the other types of science needed to comply with the broader perspective of the EU is more contested. Organisations such as the Ebro Catchment Authority founded in 1926 sees themselves as world leaders in developing evidence based policy. There is certainly a strong emphasis on developing elaborate definitions of drought and DSS systems. On the other hand NGOs such as WWF and the New Water Foundation claim that data showing the extent of irrigation for example is very difficult to obtain. However the EU with its very demanding and elaborate reporting frameworks is a source of increasing pressure for a wider range of more available data.

4. The capacity to consult effectively with the wider community

In Spain consultation and public participation in water management is largely limited to traditional users with an economic interest. Water user organisations are well represented at many different levels of the water management system but there is little recognition of users outside of the long established irrigation communities. There is considerable pressure from the EU WFD to go much wider but this is not happening easily in Spain. The only significant exception apparently is Catalonia. For water users outside the traditional framework exclusion can mean, paradoxically, lack of

supervision as in the case of non-traditional water users accessing groundwater who operate unsupervised in many places. Illegal groundwater use is rife and efforts to bring it under control within a management framework as in the upper Guadiana catchment have been largely unsuccessful.

Consultation and increased public participation reference concepts of democracy that are alien to the management culture within many Spanish government organisations which draw heavily on a very authoritarian tradition (the Franco legacy and before). But increased public participation is a major element of the EU's Water Framework directive and Spanish NGOs are becoming more active. New approaches to water such as New Water Culture and the Zaragoza charter are receiving increasing public support. Some commentators have observed that water is often a major political issue and with each election the winning position has been greener than before. A proposed transfer of water from the Ebro catchment water transfer was opposed by a 400,000 person demonstration in the lead up to the 2004 national election. The transfer was cancelled when the Socialists won, signalling a major pull back from the hydrological redistribution across the nation that had been the dominant vision of Spanish water policy for over a century.

Although Spanish water management is dominated by governments and technocratic administrators wider cultural influences are having an impact. The New Water Culture movement and the Zaragoza Charter released in 2008 place strong emphasis on adapting to climate change, environmental and cultural issues and public participation. This movement apparently had strong support from the recent national minister for water until she was forced out of the portfolio apparently as a result of pressure from traditional water user groups.

These issues are part of a larger debate re the nature and place of democracy in Spanish society. An example of the pressures on Spain resulting from membership of the European Union is the Aarhus convention on access to information and justice in environmental matters and public participation in decision making. A product of the United Nations Economic Commission for Europe it was signed in 1998 in the town of Aarhus. As of July 2009 it had been signed by over 40 countries and the European Union. The convention focuses on the interaction between the public and government agencies. It gives the public rights to information, participation and access to justice in relation to government activities concerning the environment widely defined.

The review mechanism that is part of the convention is unique in that it gives complainants direct access to a committee of international legal experts empowered to consider the merits of complaints. It is an appeals body able to consider the actions of the various national governments that have signed the convention. Known as the Compliance Committee this body makes recommendations to the full Meetings of the Parties (those governments that have ratified the Convention). Because that body meets rarely governments normally act in response to recommendations from the Compliance Committee to avoid formal decisions being recorded against them.

Appeals to the Compliance Committee can come from four sources, governments about themselves (presumably rare), governments against other governments, the convention secretariat against a government and members of the public or NGOs against a government. Up until August 2009, from the governments that are

signatories worldwide, the Compliance Committee had received 41 submissions from the public, mainly from NGOs and one from a government. Looking at the implementation of the Convention in Spain this example shows the interesting tensions being created by these EU driven processes. Spain ratified the Aarhus Convention in 2004 making it enforceable through the national legal system. However critics within Spain claim that the Spanish government has not followed through with the staff, budgets and public education needed to make it operable and a real force in water management. That said the pressure is presumably can be expected to become increasingly significant in the longer term.

5. The capacity to negotiate between competing issues

Spanish water management is dominated by the national government, officials in the catchment management authorities and representatives from the long established water users organisations (irrigators). In principle – given the strong control by governments – the system would appear to allow effective responses to be made in response to changing priorities. In practice the system is dominated by irrigators, developers and politicians with strong connections with those interests. Conflicts between their goals and those promoted by the EU WFD make for a very volatile mix. There appears to be substantial incremental pressure to implement the WFD but economic and social support for traditional priorities is often overwhelming in practice. Within this governance environment there is limited capacity to negotiate between competing interests in any systematic way, not least because there is very little representation for non-economic water users in the formal management system. Other interests are excluded but this has resulted in periodic episodes where they intrude like a volcanic eruption (ie opposition to the Ebro water transfers in 2004).

The results often do not accord with either public policy or economic cost benefit criteria. For example providing water for golf courses is a very emotive issue even though the volume required is small and the economic return per megalitre is often much greater compared with the low value irrigation with which it competes. (Golf courses are central to policies to promote tourism and attract large numbers of retirees from northern Europe which are major development strategies for Spain's east coast.)

The EU's WFD provides strong encouragement to strengthen the water planning and management framework but the next water plan for the Ebro currently being prepared provides an example of the way in which the various competing pressures come together. The Ebro is heavily developed and the next water plan has to put the catchment on the pathway to meet the WFD target that hydrological systems should be managed to achieve a high ecological status. But in response to pressures from the autonomous regions the planners are also incorporating the objective of a 50% expansion in irrigation area. The aim is to reconcile these incompatible demands by allowing expansion provided the developers accept the risks involved in irrigating with low levels of climatic reliability. The planners discount the possibility that in later years developers will use political pressure to push for greater reliability at the expense of the environment and the ecological status of the river.

6. The capacity to achieve compliance

The capacity to achieve compliance appears strong when issues are being managed within traditional frameworks such as those controlled by long established water users groups. There social pressure combined with collective control of the distribution system is quite effective. Outside of such frameworks the capacity to control dissidents seems rather weak. As already mentioned the widespread flouting of groundwater restrictions is an obvious example.

At the national and EU level the picture is complex but interesting. Its hard to find examples of penalties imposed by the EU. There seems to be an almost limitless capacity to consult and appeal about compliance issues but the need to comply with the WFD is frequently mentioned and it would appear to be a significant influence on policy and management behaviour. It is also possible that compliance with WFD standards and requirements is influencing the success rate of applications for funding under various EU programs.

The courts are rarely involved in Spanish water disputes. However water is mentioned in the Spanish constitution and this has been used on occasion. I was told that opponents of the Jucar water management plan on the east coast have apparently been able to block proposals for water transfers within the catchment by appealing against the plan's sections dealing with a number of particular streams. The latter are contained within a single autonomous region and according to the constitution should not be the subject of plans prepared by the national government's catchment authority. This – I was told - provided opponents with the opportunity to frustrate implementation of the overall plan even though they were not really interested in the streams that were the subject of the court action.

7. The capacity to adapt to novel and emerging issues

Climate change is expected to have substantial negative impacts on southern Spain with temperatures predicted to rise significantly and rainfall to decline by up to 40%. There is an international consensus that the best way to respond is through robust water planning and management that will allow rapid adjustment in response to changing circumstances. Implicit in this model is the need for these changes to be conducted in such a way that they will be understood and supported by the public. But Spanish water management appears to be locked into paths of development dominated by past practice and to have a fairly low capacity to respond to new concerns. It would also seem to be the case that there are deep divisions within Spanish society about the appropriate aims for future policy. The WFD is pushing in directions similar to Australia's NWI but as is the case here the resistance in Spain is powerful.

South Africa

(The original report in April 2009 has been retained because it was felt that useful material would be lost if it was forced into the new template)

Basin planning

Of all the nations to be considered in this project South Africa is probably the most similar to Australia in its approach to water management. Both countries aim in principle to identify first what is needed for sustainability after the level of modification has been agreed and then, second, designate what is left as being available for production. In practice, however, there has been slow progress in introducing water management based on that approach.

South African policy makers are attempting to deal with a particularly difficult situation. For them the real driver is to reverse the injustices of apartheid in a context of rapid population growth (50 million and climbing despite the ravages of a widespread Aids epidemic) and rapid urbanisation. Gender issues are very important in this context. The relevant legislation and policy – the 1998 South African Water Act, 2004 National Water Resources Strategy etc – is based on a very sophisticated conception of the nature of hydrological environments. Both the social and environmental visions have been difficult to put into practice, however.

Another difference, compared with Australia, is the prevalence of inter-basin transfers in part the result of large settlements, many of them originally mining based, sited well away from good water supplies. In Australia the Snowy mountains scheme is a large inter-basin transfer project but it is not part of what almost seems to be a national grid as in South Africa. Of the 19 water management areas established under the new legislation only one is not involved in an inter-basin transfer of some sort. Perhaps this degree of integration is one of the reasons why the provinces do not have a significant role. A key principle of the 2004 National Water Management Strategy which implements the 1998 South African Water Act is that there should be no payment to basins supplying water because ‘water is a natural resource that belongs to all the people’ (ie not to the people of a particular basin). Transfers are part of the process by which the central government maximises the national welfare and it does not conceptually accept that the water that is being moved about belongs to one basin more than another. In addition there are water quality issues – many of them related to mining – which are also very important although the South African government is struggling to work out how best to manage them.

Currently water policy and implementation is still a central government operation but eventually that role will be refined so that it is largely strategic and regulatory. Part of this strategic function will be to define the ‘Reserve’ that is to apply to all water management areas. They are then to be graded in three classes, natural, moderately impacted and heavily impacted and the Reserve for each class is to vary accordingly. The Reserve has two components the first is for basic human needs and the second is to maintain essential hydrological/ecological characteristics. In practice it has been a

very slow process defining the Reserve for each water management area and most parts of the country are still to go through that process.

Relationship between the central government and provinces

In comparison with the states in Australia, provinces in South Africa play a very minor role in water management. The National Water Management Strategy envisages a staged process starting from almost complete central government control – the current situation - to the creation of 19 catchment management authorities to manage the water management areas. The CMAs will progressively take on more and more functions leaving the national government with a strategic and auditing role. Unlike the current situation in Australia the South African CMAs will also control the allocation process (working within what is available after the national government has set the Reserve for that water management area). Its as if the roles of, say, Goulburn Murray Water and the Goulburn Broken CMA and some of those of the relevant Victorian minister and the MDBA were merged. The borders of the water management areas for which the CMAs are responsible are based on catchments and apparently cross provincial borders in at least some cases. There is the added complication that four of the major rivers covering 60% of South Africa's area also cross national borders as well as state borders.

Even when the new system is mature the South African national government minister will still retain responsibility for:-

- appointments to the CMA boards and the Water Tribunal (a quasi judicial body),
- determining the class of each of the water management areas (I'm not sure to what extent there is variation within water management areas) and setting the Reserve for that class,
- defining the water requirements needed to meet international obligations for the four shared international river basins, and
- managing inter-basin water transfers.

Role of govts re individuals economic interests etc

The South African Water Act 1998 states that the government is the public trustee for water in that country. This overturned the previous situation where water was managed largely under a riparian rights system in which governments played only a minor role. Part of the process of introducing the new system involved setting up a central registry of the un-documented previous rights. The introduction of a water charge caused many claimants to significantly scale back the size of the entitlements that they were originally asserting. (There does not seem to be much interest in establishing a water trading system to trade those entitlements, however.)

According to the legislation and the NWRS these new entitlements can only be activated or formalised after plans incorporating the new Reserve have been approved. That is proving a slow process.

Place of irrigation

Established irrigation is largely identified with the previous Apartheid regime so it does not have the moral high ground. However it still remain powerful in practice

even though it not as significant as in Australia in its contribution to the rural economy. In principle the new approach would involve the claimants sharing proportionally the water left over after the Reserve is determined but it has been difficult to give priority to the Reserve in practice. In addition, there is strong pressure to provide increased allocations because a proportion of any new allocations is designated for the black South Africans who were previously excluded. Scaling back allocations – which many water researchers concerned about environmental conditions argue for – is thus very difficult to do.

Treatment of the environment

The environment is given recognition in the Reserve (after the provision of a fairly low volume per head as a basic human right.) although most of the researchers who discussed this issue at the Pt Elizabeth environmental water allocations conference stated that the reasons for doing so are obscure to the general population. There is apparently little or no acceptance of the proposition that the environment has a right for its own sake. Arguments are framed to emphasize the benefits to people of preserving key ecosystem services or ecological functionality although that too is poorly understood in the wider community.

It is still early days re implementation of the 2004 NWRS but from my reading of the material about the Reserve it would appear that environmental water is to be rules based water rather than entitlement water (to use Australian terms). It is notable, however, that many of the papers presented to the Pt Elizabeth conference focussed on management regimes and not merely on the need to provide adequate volumes of water designated as environmental allocations.

Treatment of Indigenous interests

In Australia one of the major unresolved issues is how to give appropriate recognition to the needs and rights of indigenous people in the water reform process. The Australian conception of indigenous and non-indigenous is not applicable to South Africa but it perhaps useful to look at the treatment of their goals re poverty alleviation in both rural and urban areas (particularly in relation to women), the situation of landless and homeless people, the HIV/AIDs affected, disabled people and pensioners. These are a very high priority for their water reform program. South Africa is one of the few countries in the world to include the individual's right to water in its constitution. (Australia achieves a similar result but via different means.) Nevertheless despite the differences it would probably be useful for Australian policy makers working on Indigenous water access issues to keep informed about developments in South Africa given that their water planners are investing considerable effort in the difficult questions involved.

Treatment of urban stakeholders

The South African water management system does not have a problem with giving a high priority to urban consumers. (It seems that there is nothing like the resistance that is evident in the southern MDB re water for Melbourne for example) In part this is because established irrigation is to a significant degree identified with interests that gained their advantages under the Apartheid regime while urban areas contain large

numbers of black South Africans who now have much more political power. That said there is still a very long way to go before water delivery to individual families in the dense squatter settlements surrounding each of the large cities will be satisfactory.

Development of monitoring systems

As is the situation world-wide South African water researchers and managers are struggling to meet the information needs of the very sophisticated water management systems which are being introduced. The proceedings of the Pt Elizabeth conference, however, showcased a wide range of talent and innovative approaches to the various challenges and dilemmas involved.

Conclusion

The South Africa water reform program has both significant similarities and differences compared with Australia. They do have some similarities from the viewpoint of climate variability and predictions for climate change. On the other hand the relatively higher degree of integration via inter-basin transfers, the lower priority given to established irrigation and very high priority given to using water to help achieve fundamental social change and alleviate poverty makes for substantial differences in the policy and management challenges.

In both countries - focussing on the MDB in the case of Australia - the national government is asserting a dominant role regarding strategic planning. Also in both cases there is the explicit goal of achieving sustainability and - at a very broad level - a similar definition of what that might be. At the conceptual and policy level the environment is given a high level of priority but in practice there is real difficulty in with implementation.

An interesting contrast to what is happening in Australia is provided by the way the South Africans are attempting to create a layered system of water management with strong catchment management authorities. Looking to the future and speculating about the possible outcomes of the institutional reforms being introduced in South Africa and Australia it would seem that their system will in theory allow more ongoing central intervention. Their catchment authorities run by centrally appointed board members, and required to review their catchment plans at least every five years are likely to be less autonomous – for better or worse – than will be the case in Australia where states with long histories of independent operation will work to 10 year plans. One challenge that both share is capacity constraints not helped in the South Africa case – so I was told on a number of occasions - by the emigration of large numbers of water managers to Australia.

Australia (Murray Darling Basin)

The MDB is just over a million square kilometres in size, has a diverse range of landscapes, ecosystems, land uses and climates and includes over 30,000 wetlands, eleven of which are listed under the Ramsar Convention of Wetlands of International Importance. Divided between the states of New South Wales, Victoria, South Australia and Queensland and the Australian Capital Territory – each with their different systems of water entitlements and management - the MDB is home to just under two million people and supplies much of the water used by another million in South Australia. Those three million people and various industrial activities use about 4 percent of the water diverted from the regions rivers. The other 96 percent is used by irrigated agriculture and supports nearly three quarters of that activity conducted nation-wide. From all sources the MDB produces approximately 40 percent of Australia's gross value of agriculture. Despite the existence of a near century old inter-jurisdictional water management framework that brings together six governments, however, environmental degradation of the region's surface and groundwater bodies and their catchments is intensifying and the debate about the future of the inter-jurisdictional institutions in the MDB is gathering momentum.

Water management in the MDB is in crisis due to a combination of inadequate governance and the worst drought since records began to be kept in the late nineteenth century. A central issue is how much water should be taken away from irrigation to maintain riverine environments during times of high stress. The economic impacts of the drought in the southern section of the MDB along the River Murray are increasingly severe and the lower lakes near the outlet to the sea are on the verge of environmental collapse. In response to this and similar crisis in many other parts of the MDB the six governments with responsibilities in the region are attempting to implement the most radical institutional and policy changes since intergovernmental coordination was first attempted nearly a century ago. Central to the new arrangements is a shift in the control of policy away from state governments to the national government and the introduction of a MDB Basin Plan that for the first time will take a whole-of-catchment approach to distributing the costs and benefits of water management. One of the changes expected to come from implementation of the MDB Basin Plan is an increase in the volume of water allocated to the environment away from production activities such as irrigation. This will involve complex negotiations with a wide range of stakeholders the difficulty of which will be increased by the reduction in stream inflows expected to result from climate change.

1. The capacity to manage across borders

The history of development in the MDB indicates that it would have been best to put in a comprehensive management structure at the very beginning (as was attempted, see below). Once the incremental path was chosen it then became very difficult to exercise strategic direction over the path of events. In the MDB the incremental option has shown itself prone to capture by stakeholder interests that became dominant as development intensified. This is significant given that the need for reform has often been in response to problems caused by their activities. The result of

their dominance of the redesign process is that there is continual pressure to protect their interests to the greatest degree possible. Arguably this was a major cause of the eventual failure of the reforms of the 1980s and it provides the most serious threat to the current reform effort now getting under way with the implementation of the Commonwealth Water Act 2007 and the development of the MD Basin Plan.

It is of course quite legitimate for stakeholder groups to protect their own interests. Ideally this should happen, however, within an institutional framework that can also take account of the wider interests of society and other issues such as the need to preserve the ecological integrity of the river system as required by the National Water Initiative. As described below the initial plan for cross border decision making in the MDB was centred on the Interstate Commission. It would have provided a decision making framework that combined the capacity to make difficult decisions from a River Murray basin-wide perspective but with considerable decentralization and autonomy at the sub-catchment level (in accordance with the principle of subsidiarity). Instead, state interests have been able to insist on minimal cooperation and maintain a state orientated sub-basin focus for decisions ever since. As a result three (now four with the more recent addition of Queensland) separate foci for stakeholder interests became consolidated and able to frustrate many of the whole-of-basin type reforms attempted in recent decades.

It can be argued that these three largely autonomous zones would not have developed over the course of the twentieth century if the original plan for the cross-border management framework for the River Murray had been put in place. The first phase of cross border water management was in the early twentieth century. The River Murray Waters Agreement and the River Murray Commission – the framework and organization that managed cross-border water issues in the southern MDB until the 1980s - were originally designed to operate in combination with the Interstate Commission which was meant to be a major part of the Australian federal system. These plans were frustrated, however, by a High Court decision in 1915 that stripped the Interstate Commission of most of its powers.

Over the course of the twentieth century development pressures have gradually undermined environmental conditions and resource security. In 2007 the response of the Commonwealth Government was to enact the *Water Act 2007*. The new arrangements involved a very substantial shift in power over policy to the Commonwealth Government. The Murray Darling Basin Commission was replaced by the Murray Darling Basin Authority which in addition to the responsibilities for water sharing between the states and a range of programs such as those dealing with water salinity previously exercised by the Commission was also tasked to prepare a Basin Plan by 2011. Previously the central MDB framework had dealt only with a limited range of issues agreed upon through a voting process requiring unanimity. The Basin Plan is to be comprehensive and deal with all issues that threaten environmental conditions and resource security with a catchment wide perspective ignoring state borders. It will be implemented by 10 year sub-plans that will be developed by each of the states in the MDB. They in turn will shape the various regional and sub catchment plans within their areas of jurisdiction. Backing the Basin Plan will be substantial payments to reward compliance from the Commonwealth.

Central is the role of the Commonwealth minister designated with the responsibility of approving the Basin Plan, the state sub plans and many related decisions albeit subject to advice from the MDB Authority and the new MDB Ministerial Council. But what would happen if the key minister was part of a government that was aggressively pro-agricultural development, skeptical about predictions of climate change and unsympathetic to sustainability and environmental perspectives? That was the situation for much of the time during which the Howard government was in office. Separate from that there is the continued danger that regional or state based interest groups will still find it easy to undermine whole-of-basin perspectives. For a start the new arrangements are based on the referral of powers from the states that can be revoked. But it is not only state governments that will fight for the interests of their state against basin-wide perspectives and cost benefit criteria. The Commonwealth parliament is made up of members elected from the states. When the pressure is on they can be expected to lobby for state interests just as aggressively as their counter parts in the state governments.

It can be argued that there is nothing in these new arrangements that would make them more able to resist pressure from state interests than previous arrangements. If the MDB Authority produces a draft Basin Plan that would involve significant political costs to one of the state governments there is no real risk involved in them resisting it. The *Water Act 2007/8* explicitly excludes any penalties from being imposed on non compliant state governments apart from the withholding of funds. That strategy was tried with very mixed success in 2005 when National Competition Policy payments were reduced in response to New South Wales poor record in implementing water reforms. The New South Wales government responded by reducing its funding for the Murray Darling Basin Commission and environmental programs. It seems likely that the commonwealth concluded that the result was not worth the trouble. Consequently it would seem that the provisions for pressing the states to cooperate with a basin-wide perspective are no stronger under the new arrangements than they were under the 1980 arrangements.

There has never been an official inquiry into why those earlier efforts were not successful. In the case of disasters such as bushfires and air crashes an analysis of what went wrong is mandatory. Policy and institutional failures are examined more rarely, however, even though the consequences are often much greater. Systematic study of the history of policy and institutional innovation in the MDB - and the reasons for successes and failures - should be given a much higher priority if we want to produce better results than we have achieved in the past.

2. The capacity to respond expeditiously to crisis

Some crisis are managed with appropriate speed in the MDB and others are much more difficult. The issues involved can be explored by looking at three examples:

1. the emergency release from Hume Dam in 1996,
2. the response to the current drought which resulted in the 'critical human needs' principle which was agreed at the 2007 Melbourne Cup COAG meeting of 2007, and

3. the crisis that has been slowly unfolding over the future management of the lower lakes in recent years.

In August 1996 the Murray Darling Basin Commission made an emergency release of a large volume of water because of concern about the structural stability of a key section of the wall of Hume Dam. The release prolonged a flood that was already underway and resulted in the Commission subsequently making payments of approximately three million dollars on a ex gratia no faults admitted basis to a number of claimants who suffered material damage additional to that caused by the flood. (A post-event analysis by eminent international experts concluded that the actions of the MDBC were justified because of the very high possibility that the wall would have collapsed if the pressure caused by the high water levels in Hume had been maintained. Such a collapse would have released a massive wave which would have reached the city of Albury in about 45 minutes.) Subsequently the dam was substantially rebuilt so that it now meets a much higher standard of safety. This episode showed a very high capacity for the MDB authorities to react appropriately to a serious crisis.

Some types of crisis are easier to handle than others, however. The second example is that of the decision by COAG in November 2007 to give priority to critical human needs ie towns and people, if necessary without regard to political borders, over agriculture and other interests in circumstances of extreme drought in the MDB. This decision was not reached as easily as that made about the safety of Hume Dam in 1996 but when the pressure was really on it still proved possible to act decisively. In part this was a product of the way in which water rights are defined in Australia. Ultimately governments retain the responsibility to use water to promote the public interest. Although water property rights in the United States are not absolute the power of governments in the south-west region to make such decisions is much less than in Australia. In part this is a legal issue but even more it is cultural. It is likely that there is a much higher expectation on the part of the Australian public that governments will act in this way than there is in southern California and Arizona.

The third example is more problematic. There is widespread agreement that the lower lakes are in a state of crisis and continuing decline but little agreement about what should be done. In the case of the 'critical human needs' decision cost benefit analysis clearly favoured protecting social and economic assets in the dependent communities. In the lower lakes there is not one stakeholder group whose claims are obviously superior to others. All options being considered will result in substantial costs to one or more significant group or groups. The result appears to be decision-making paralysis even though almost everyone agrees that the do-nothing option is probably the worst.

3. The capacity to base policy on good science

The MDB has a long history of major knowledge projects driving policy. Many of the key ideas that shaped policy and management through the twentieth century were contained in the 1902 Interstate Royal Commission into the future management of the River Murray and the early engineering studies conducted before the River Murray Commission was established in 1917. These include recognition of the need to

develop water sharing and management approaches that could take account of highly variable flows and the absolute necessity for a comprehensive range of good data based on common standards across borders as a starting point for policy. (A finding which is finally being implemented through the Water Act 2007.) More recently there were the salinity studies which underpinned the reforms of the 1980s and the numerous large scale studies commissioned into a wide range of biophysical and institutional issues in the 1990s and 2000s. Projects such as the MDB Ministerial Council commissioned CSIRO study of threats to inflows were a significant factor prompting the reforms of 2007 (as was also the long ignored annual Independent Audit Group reports on the implementation of the Murray Darling Basin Cap on extractions). With the formation of the MDBA the process of harnessing science to policy has become even more intense. Currently these efforts centre round the MD Basin Plan the preparation of which now involves a substantial body of researchers working within the planning team. Mirroring on a national scale the international debate about climate change science and policy, the science underpinning the MD Basin plan will be the focus for intense discussion regarding the role and credibility of science and research upon which it is based when the draft plan is released in mid 2010.

4. The capacity to consult effectively with the wider community

There is a long history of public participation in the MDB. A commonly chosen starting point for the history of cross border management in the MDB is the 1902 Corowa conference and the Interstate Royal Commission of inquiry into the future of the River Murray which delivered its findings at the end of that year after considering submissions from a wide range of interest groups and individuals. It provided the foundation for the approach to basin wide management that has been used ever since. The Corowa conference was a major circuit breaker pushing governments in the southern MDB to resolve questions that had been left undecided in the writing of the Australian Constitution in the late 1890s. A similar role was played by groups such as the Murray Valley League that agitated for the reforms of the 1980s and the MDB Ministerial Council Community Advisory Committee in relation to the decision to impose a cap on surface water extractions in the mid 1990s.

That said, there is also a long history of ambivalence on the part of governments about how and to what degree the public and stakeholder groups should be involved. For much of the twentieth century governments have tightly controlled the way in which these questions are dealt with. Periodically, however, public interest has reached a level of intensity where they loose control. The Corowa conference was one example. Another could be the controversy now shaping up about the future of the lower lakes in South Australia. In that instance it would appear that a number of incompatible demands from powerful stakeholder groups – upstream irrigation, local populations including the large holiday/retirement community on Hindmarsh Island, residents of Adelaide and other towns drawing water downstream of lock one, fisherpersons, environmentalists, Indigenous people in the region etc – are interacting with the impacts of long-term drought/climate change and creating social, economic and cultural conflicts that are difficult to define and even harder to manage.

In the longer term if Australian society, working through its governments, is unable to introduce reforms such as those proposed in the National Water Initiative it is likely

that conflicts caused by unsustainable approaches to water management, such as that developing over the future of the lower lakes, will become more frequent and politically disruptive. (It may be that recent record rains in the north of the MDB will temporarily resolve the crisis in the lower lakes but that does not diminish its significance as an example of the type of conflict that could become common given the predictions for the climate of the MDB.) From a more optimistic perspective, however, the importance of public participation in the MDB is well understood and efforts to promote it will play a major role in the implementation of the MD Basin Plan. As one of the world's oldest and most successful democracies Australia has deep cultural resources and sophisticated institutions for managing conflict.

5. The capacity to negotiate between competing issues

This is an issue that all water management systems struggle with – how can society maximise the benefits and minimize the costs of the water available and at the same time protect the interests of future users (including current users in the future). In essence the founding vision of the COAG rural water reform program and the National Water Initiative was simple. First restore over-allocated systems to sustainable levels of extraction and then use water trading to move water to those geographical areas and those uses – be they urban, industrial, agricultural, cultural or environmental – where it will provide the greatest benefit to society. To achieve this reformation much of the NWI focussed on the development of a framework for a system of water entitlements that would be consistent across the MDB. It also stressed the importance of moving to a common water trading zone across state borders as soon as possible.

To be properly understood the NWI needs to be viewed in the wider context of National Competition Policy, arguably CoAG's primary concern. It is part of the nation-building enterprise that began well before federation in 1901 and not merely an attempt to solve Australia's contentious water management problems. The aim is to meld the semi-autonomous states into a more unified national economy and society. In the sphere of water policy the NWI is meant to promote this process by strengthening management, encouraging water trading and reducing the significance of state borders. For 150 years, agricultural and pastoral development in the southern part of the MDB has been dominated by the state capital cities, in effect creating three competing centres of economic activity. From the late nineteenth century to the middle decades of the twentieth, the three states established irrigation-based communities in their hinterlands and provided subsidised water and many other services to promote their growth. At the same time they developed their railway networks to link them to their state capitals and discourage trade across state borders. The placement of these communities and the policies used to promote them made sense to decision makers who were fostering state-based economies but in some cases at least they now make less sense from a national or basin-wide perspective. The NWI was meant to provide a process that would bring the four state focussed zones together and rationalize overlapping and contradictory elements.

Defined in different ways by different generations of policy makers the question – how can benefits for society in the MDB be maximized? – has been the primary issue since the cross border water management framework was first introduced early in the

twentieth century. In the middle decades of the twentieth century one of the policy priorities was the need to increase the volume available and improve the security of supply throughout South Australia. As a result most South Australian towns are now linked to the Murray. Nearly half of Adelaide's water comes from the Murray in average years and during times of drought its dependence has gone as high as 90%. Without this water the state's population and economic base would be much smaller than today. The wealth generated as a result of the water distributed to South Australian towns is much greater than the economic return from irrigation from the whole of the MDB yet the water used is less than 2 % of all water extracted. Irrigation in the MDB takes about 95%. One of the aims of national competition policy was to apply this approach more widely and increase the benefits to be gained from use of the nation's water.

The expectation was that the reforms proposed in 1994 and through the NWI would be the vehicle to provide these benefits. The struggle to implement that framework is still very much underway but six years after approval of the NWI water managers continue to struggle to move water across borders and between uses to maximise benefits. Although another attempt is being made through the MD Basin plan it has proved much more difficult than expected to develop a common system of entitlements throughout the MDB and there continues to be severe restraints on the trade of water entitlements across state borders. The original aim was to use trade to maximize benefits by trading across borders in the MDB and between uses but this vision has not been achieved. Most trade of water entitlements is within states and within their four agricultural sectors. (Distinct from the trade in entitlements – permanent water – there is a substantial trade in temporary annual water.) The most dramatic illustration of the impasse is the controversy over the Sugarloaf project in southern Victoria. In that instance the proposed transfer of less than 1% of the water extracted in the MDB – currently used for low value irrigation – would result in a very substantial increase in the water security of Australia's second largest city. For Adelaide and Melbourne the reliable provision of relatively small volumes of water from the MDB would have avoided the need for large, high-energy desalination plants. It is hard to see this situation changing in the immediate future without a major shift in public thinking about the priorities that shape Australian water policy. If implemented the 1994 rural water reform/NWI program could provide very large benefits but the formula proposed for its delivery is not widely understood or supported by the public.

A more successful example of the way in which a more comprehensive approach to water management can provide a good foundation for the long term is provided by the debate about the future of Lake Victoria in the 1990s and early 2000s. Lake Victoria is a major storage on the River Murray in south-west New South Wales near the South Australian border. It plays a crucial management role juggling the flows coming from the Darling and Murray rivers that join a few kilometres upstream and reducing the restrictions caused by the Barmah Choke further up the Murray. Without it supplies to irrigators in the mid-Murray would frequently be disrupted by the need to give priority to flows to South Australia as required by the long standing agreement between the states. The lowering of the lake in 1994 to allow repairs revealed a large number of Aboriginal graves reflecting many thousands of years of occupation. After years of protracted negotiations with the Aboriginal community connected to the lake, and more than \$4 million for conservation work to protect the gravesites and cultural

material, a new operational plan was agreed in 2002. The previous plan had focused on supplying water to South Australia and mitigating some of the salinity impacts of the river management regime then in place. By contrast, the new plan takes account of a much wider range of issues, particularly Indigenous and environmental. It also includes processes for community involvement and regular consultation with the regional Indigenous community. The Lake Victoria project made the Ministerial Council and Commission aware that many other parts of the riverine system in the Basin require similar consideration of Indigenous interests, in that rivers and their banks have always been prime sites for human activity and habitation. It also settled a dispute that threatened to significantly reduce organisational capacity to manage the river effectively.

6. The capacity to achieve compliance

Compliance is a very complex issue particularly in a democratic society such as Australia. In essence it is not practical to enforce laws or regulations that do not have the support of the public and the group directly affected. In terms of environmental and water management there is only tepid public support for actions to deal with non compliance by a determined individual. For example, restrictions for the clearing of native vegetation are only rarely enforced and when they are the penalties are relatively mild. Similarly, severe penalties for water theft except in times of drought would not be supported in many rural communities.

The same applies to governments. The new Commonwealth Water Act does not contain penalties for governments that choose to defy it. The inducement to comply with the MD Basin Plan is created by the capacity of the Commonwealth to refuse to fund state infrastructure projects. This is similar to the process used to promote compliance with National Competition Policy. In the field of water reform this approach has had mixed success. In 2004 the National Competition Council conducted an audit of NSW compliance with the 1994 rural water reforms (delayed by a year because NSW was not ready at the scheduled time). As a result of unsatisfactory findings in the audit the NCC reduced NCP payments to that state by \$26 million (later adjusted to \$13 million). NSW responded by cutting environmental programs and reduced their annual contribution to the Murray Darling Basin Commission. Contributions from the other states to the MDBC were linked to those of NSW by a ratio arrangement so this resulted in additional cuts by those states. This series of events demonstrates that the threat of withholding payments does not invariably promote sustainable water management.

7. The capacity to adapt to novel and emerging issues

This question can be answered on two levels. In principle the *National Water Initiative* provides a robust framework for dealing with future issues. In practice the record of implementation in Australia since that policy was approved by the Council of Australian Governments in 2004 is seriously inadequate as shown by the National Water Commission's biennial assessment of implementation of the NWI. The reasons for the failure in implementation are complex and need further investigation. Assessment of the implications of policy or of what causes policy failure is not something that is done well in Australia (or in most places). Looking at the history of management in the MDB there has been very little analysis of the past. Beyond

symptoms such as over allocation and salinization where is the discussion about why those things happened? In Australia in the non-MDB states it is common to hear that 'we must avoid the mistakes of the MDB' but what were those mistakes? Why did the institutional framework established in the 1980s fail? Was it only the unanimity principle or were there other more structural weaknesses? Contemplating the present it is interesting to ask whether the processes to promote compliance by the state governments contained in the new Water Act 2007 will be successful. That is an important question, given that this mechanism has been fairly unsuccessful in the past.

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