

Executive summary

Purpose

Water planning is a key aspect of the 2004 Intergovernmental Agreement on a National Water Initiative (NWI), and one of the most important tools for achieving sustainable use of water. Water planning requires consideration of best available science and water use values to develop measurable objectives to manage water resource systems equitably and sustainably. The type of water planning with which the NWI and this report is concerned is water allocation/ water sharing planning. At its core is planning for the extraction of water (both quantity and timing) from rivers and aquifers for irrigation, towns and cities, rural stock and domestic and other purposes. It also includes the management of infrastructure such as dams and weirs used to store and manipulate flows to supply water for extraction.

While in its broader sense water planning can apply to a range of matters such as flood risk, water quality, urban and rural water delivery systems etc, these are not the focus of water planning under the NWI, though they are linked to it and are sometimes addressed in the same planning process.

State and territory water planning authorities have invested many millions of dollars into water planning during the past 10 years. Approaches have varied dramatically from jurisdiction to jurisdiction, and indeed between regions within jurisdictions. The process has evolved with experience. With its relatively recent introduction, water planning approaches have, of necessity, been experimental in nature. The resulting effectiveness of those plans has varied, and plans have generally not been objectively evaluated.

It is clear that there are lessons being learned by individual states and territories that would benefit water planning in other jurisdictions if the experiences were shared. The opportunity exists for a major step forward in sharing knowledge through the building of a national knowledge bank that draws together the accumulated experience of the last 10 years and makes that knowledge available to all.

This report is an analysis of current practice and lessons learned in water planning. It is drawn from 11 case studies of water plans across Australia, examining the processes used to develop the plans and the content of the plans themselves. The case studies were selected to be representative of the different approaches taken around Australia and to cover a range of different issues. The report is a broad sample of significant processes, approaches, scope and content. It is intended to initiate sharing of experiences between water planners in different jurisdictions. It is also intended to be a catalyst for further research and for development of improved approaches and for improvement in water-planning practices nationally.

Case studies

Case studies were selected to provide a representation of the main approaches to water planning in Australian jurisdictions. The 11 case studies were:

- Water Sharing Plan for Gwydir Regulated River Source, New South Wales (NSW)
- Water Sharing Plan for the Lower Gwydir Groundwater Source, NSW
- Lower North Coast Water Sharing Plan, NSW
- Central Region Sustain Sustainable Water Strategy, Victoria
- Water Resources (Burnett Basin) Plan and groundwater amendment, the Regional Operations Plan and amendments, Queensland
- Water Resources (Condamine-Balonne) Plan and regional operations plans, Queensland
- Padthaway Water Allocation Plan, South Australia
- Katherine/Tindall Limestone Aquifer Water Allocation Plan, Northern Territory

- Lakes Sorell and Crescent Water Management Plan, Tasmania
- River Clyde Water Management Plan, Tasmania
- Ord River Water Management Plan, Western Australia.

It can be seen that the labelling of water plans varies across the country, as does the scope and scale of the plans. Some of the plans are now several years old and jurisdictions have moved on in the way they prepare plans. Nonetheless the lessons to be learnt from these are still valid.

Method

The 11 case studies were investigated and analysed using a framework that combines two perspectives: (1) steps in the strategic planning process, and (2) the five major NWI themes related to water planning.

Considering that water allocation planning is, in fact, a specific kind of strategic planning, the following generic steps can be considered to apply to the development of a water allocation plan:

1. *Planning initiation* – this involves making the decision to undertake planning, establishing the planning processes, and organising the human resources required to drive the process.
2. *Situational analysis* – this step looks at the current status of resources, environmental and other public benefits, uses, and socio-economic factors as well as future threats, risks and opportunities.
3. *Setting directions* – given the situational analysis, this step is where broad decisions are made on which way to go, including the objectives and outcomes that are being sought. It encompasses such things as vision statements, which are typically very broad, and outcomes or objectives, which can be more specific.
4. *Identifying and assessing strategies* – this is usually achieved through a process of identifying and assessing options (benefits, impacts, mitigation measures).
5. *Strategy selection* – this involves comparing trade-offs (including socio-economic and equity factors) and deciding on a preferred approach. Arising from this are strategies, activities and measurable targets and actions.
6. *Building in adaptability* – this step identifies how implementation and outcomes will be monitored and what should happen if things do not work as expected (for example, implementation failure, wrong assumptions, ineffective strategies, improved data, or situational change). Arising from this is a monitoring strategy and triggers for adaptation or change.
7. *Plan approval* – for water planning, this is the final Ministerial endorsement that incorporates the outcomes of the process into a statutory framework.

The five major NWI themes that relate to water planning are:

1. defining and describing *environmental and other public benefit outcomes*, and putting in place management arrangements to achieve those outcomes (clause 37)
2. defining *resource security outcomes* and water allocation and trading rules, and adjusting overallocated or overused systems (clauses 37, 43)
3. putting in place mechanisms for *risk management and adaptability* to improved information and knowledge, including monitoring and reporting (clause 40)
4. consultation and *community engagement*, including Indigenous communities (clauses 52, 95)
5. *settling the trade-offs* between competing outcomes for water systems, using best available science, social and economic analysis, and community input, and to address impacts on affected entitlement holders and communities (clauses 36, 97).

The case studies were investigated in relation to the NWI themes and the general water planning analysis. The themes were then combined using the water planning steps as a framework. All the detail in the case studies is not contained in the analysis, for example specific comments made by agencies and stakeholders. We encourage readers to explore these insightful observations.

Main lessons learned

For each area of the analysis, the report contains an extensive discussion of a range of issues and a list of what we consider to be noteworthy practices and areas for development. Considering these, we have identified a number of key learnings that are set out below.

Recognising there are a variety of approaches to water planning

The approaches to 'water planning' vary significantly from jurisdiction to jurisdiction. As such, our analysis of case study plans is not comparing apples with apples. The various plans are a function of state legislation, policy and practice that has been developing since well before the advent of the NWI. This affects the overall purposes of the various plans, which range from dealing with water sharing only, to water sharing and use, to total water cycle management (in the case of the Victorian sustainable water strategies). It also affects the geographical scope of the plans.

In general, the broader the plan in terms of either geographic or thematic scope, the less specific it is about practical management rules, and the less clarity there is about factors affecting individual water entitlement holders' resource security, and about specific environmental management rules. Conversely, the more specific plans are, the less they consider wider trade-offs and broader supply and natural resource management (NRM) issues (including other catchment impacts on river health). Most commonly, there is a trend towards detailed plans sitting in a context of broad strategic plans or statewide 'default' policies and rules. Attempts to compare plans in different jurisdictions must recognise these differences.

Integrating water allocation planning with catchment/natural resource management and water supply planning

In nearly all of the case studies, we observed that the jurisdictions are still working to come to grips with the integration of water allocation planning with regional NRM planning (in some jurisdictions called catchment planning) and urban water supply planning. Mostly, urban water supply and NRM planning are run separately to water allocation planning. Linkages between these processes and water allocation planning appeared to be somewhat tenuous and *ad hoc*, although most statutes in theory require water plans to be consistent with NRM plans. It would be fair to say, however, that regional NRM plans themselves are in an early stage of development in most states, and in some instances, the water plans precede these. It is also apparent that in many of the case study plans, urban water supply was a very minor aspect of water sharing.

Regional NRM strategies or catchment action plans can provide the catchment context for water planning. They bring with them broader NRM assessments of land use, rivers, aquifers and dependent ecosystems. These are increasingly using repeatable and objective methods, which include environmental, social and economic value and risk assessments. These are critical to effective planning to ensure that investment and trade-offs are properly prioritised to deliver the best results. Integrating processes would also bring benefits in coordinating community engagement.

Inclusion of urban water supply planning into the same framework can ensure that river health and catchment priorities are properly considered in developing options for urban water supply.

The Victorian Central Region Sustainable Water Strategy (SWS) was the best example of integration we saw. The SWS is a regional strategic plan sitting over the top of river health and urban water supply planning. It identifies strategies that can meet multiple objectives relating to river health and water supply. It is essentially an integrated investment strategy that balances river health with economic and social outcomes and also links the management of

water with catchment investment strategies driven by the NRM National Action Plan (NAP) and Natural Heritage Trust (NHT).

Commenting on the Central Region SWS, several interviewees noted the value of having urban and rural water authorities and catchment management authorities working together to come up with ways to achieve both environmental and water supply objectives. All the participants were forced to see beyond their immediate systems and areas of responsibility to the larger picture of water supply and river health. They worked together in the broader context to deliver an integrated outcome, across multiple water sources that considered options for both supply and demand.

One criticism levelled at the Victorian approach was that water entitlement planning (which is quarantined from this process as a matter of state policy) should be brought under this umbrella also. The SWS dealt with adjusting entitlements (where it was considered warranted) by planning for investments in such things as water efficiency savings, which could be traded off for water entitlement reductions. Provision for across the board changes to water entitlements to increase environmental water, which is a fundamental aspect of water allocation plans in the other states, is managed through a separate review process in Victoria at 15-year intervals.

In Queensland, a separate process is used for developing regional water security programs, which are intended to forecast and plan for regional water demands into the future. It was suggested that these should be subject to the same scrutiny as water resource plans and resource operations plans and integrated into the water planning process at the review stage if not possible earlier.

Integration provides greater opportunities for packaging strategies to achieve a better overall outcome. On the other hand rigid constraints on what strategies could or could not be included because of institutional rigidity frustrated many stakeholders and resulted in sub-optimal outcomes.

With the exception of Victoria, government funded measures to enable or support entitlement reductions were not considered 'up front' in water allocation planning processes, even though investments of this kind might be the most effective measures to improve river health. The New South Wales (NSW) plans were also limited by current infrastructure. Addition or modification of structures for environmental or resource security benefits was not considered.

Development of a better coordinated and integrated approach to bringing together river health and urban water supply planning with water allocation planning should be a high priority. The concept of an overarching strategic plan as deployed in Victoria and proposed in Western Australia has merit.

Achieving ecological sustainability

Generally, the case study plans aimed at maintaining current environmental values; that is, stopping further decline. Many aimed for a partial restoration of values (Victorian Central Region, Gwydir regulated river and Tasmanian plans). The most credible approaches to defining environmental sustainability undertaken in the case study plans involved an independent assessment of 'environmental requirements' (for example, the Queensland Burnett, Victorian Central Region, and Western Australian Ord plans). These requirements were subsequently traded off to some extent in the final decision-making processes but it was done transparently.

Many plans exposed these environmental target values to significant risks by allowing for other outcomes. Most were risks associated with delaying of action (for example, to allow phase-in of entitlement reductions or changed access rules, or time to do further investigations, or implement water saving measures), or with allowing additional development or extraction. For some, the risks were left to be managed by unspecified operational measures that were yet to be devised or are devised without public scrutiny.

The principles of ecologically sustainable development should influence risk-management decision-making in relation to ecological assets. These principles include that:

- the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations (inter-generational equity)
- conservation of biological diversity and ecological integrity should be a fundamental consideration
- if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the precautionary principle).

Application of ecologically sustainable development in a framework of assessing risks would force risks to ecological assets to be weighted highly in the balancing process. Identification of a high risk of environmental degradation would mandate action to minimise the risk.

Several interviewees were of the view that the lack of certainty about ecosystem water requirements and risks as compared to the more pressing and obvious effects of reduced water for irrigation or towns resulted in greater ecological risks being taken. A disciplined approach would have triggered the precautionary principle and changed the strategies selected. It was observed that, in fact, people are far more able to adapt than ecosystems, but the thinking in water planning processes seemed to be the other way around. People have a variety of options for water supply (for example, desalination, transporting water from other areas, moving to other areas, or reducing usage), whereas if a riverine ecosystem is not supplied with water adequately, the flora and fauna cannot get water from elsewhere and are thus more vulnerable. It was noted that recent research into resilience of riverine ecosystems has shown that there are points where ecosystems collapse and whole groups of species simply die out and do not recover. This does not seem to have been factored into considerations, probably because it has not yet been clearly translated into impact assessments.

Connell¹ argues that the reality of water planning in Australia has been that the debate has really been about how much water can be spared from current use rather than how much is needed for sustainability. Certainly this is what we observed in several of the case studies.

The principles of ecologically sustainable development have been agreed to by all governments. Development of guidelines for the practical and transparent application of these principles, particularly the precautionary principle, are needed in water planning. Adherence is impaired by lack of understanding by planners and policy makers of what ecologically sustainable development means and how it applies at the practical level of water plan development. There is also a need for clearer and more easily understood ecological risk assessments that make it apparent where there is a real risk of 'severe or irreversible environmental damage'.

Forecasting future inflow patterns

In nearly all of the case studies, future inflow patterns (including groundwater recharge rates) were assumed to be a continuation of past patterns. The recent drought has brought to the fore the limitations of this assumption. It is evident that scientific assessments of possible climate change are only just beginning to be considered seriously in water planning as are the potential cumulative effects of plantation forestry, farm dams and other land use related matters.

In the South East region of South Australia, methods have been developed for assessing the impacts of plantation forestry on rainfall recharge of aquifers, and of the water extraction of trees from aquifers within reach of their roots. Based on this research, methods to incorporate plantation forestry into the water allocation system have been developed. The Victorian Central Region SWS included the only practical application of the latest information on projected climate change. It provides a useful case study in how this information can be used

¹ Connell, D 2007, *The sustainability of sustainable limits to extractions informing the NWI*, Land and Water Australia, Canberra, unpublished report.

to project possible future inflow patterns and in how the associated uncertainty can be handled.

Recent work done for Condamine-Balonne water planning has provided more accurate data about the storage potential of offstream storages built during the last 15 years. Future funding of extraction and flow monitoring using telemetry will improve knowledge about cumulative effects of overland flow harvesting.

Further development of approaches to incorporating the potential impacts of climate change and of various land use practices on future inflows and recharge into water planning is needed. Such approaches will need to assess and take account of the uncertainties involved.

Achieving distributional equity

A key and, in many cases, overriding factor in decision-making, which is rarely explicit, is perceived equity or fairness. In many statutes, the principle of equitable distribution of resources is contained in the objects, but implementing this has proved difficult. This is not surprising given the variety of perceptions of fairness held.

In the case of the Gwydir groundwater plan in NSW, a very difficult decision had been made to cut entitlements by a large amount. The affected licence holders had largely accepted the need to make the cut, and in 2004 a plan was approved (but not commenced), which provided for proportionally equal cuts in entitlements for all licence holders; however, there remained considerable unhappiness about the way the 'pain' was shared. Consequently, these licence holders continued to lobby for financial assistance from government, which eventually came from a joint state–Commonwealth fund. Additionally, a group of licence holders pushed for a change in the way the cuts were distributed between licence holders to take more account of the level of development of the entitlement. Eventually the Minister and Cabinet overturned the previous decision and required the alteration of all the major inland groundwater plans to reflect a different distribution of the cuts, which included a weighting for the level of development.

This illustrates how perceived equity in trade-offs can be critical to the success of a plan. Distribution was noted as one of four aspects of fairness in water planning by Howard². Distributional fairness relates to the way the benefits or costs are shared. The case studies suggest that significant unaddressed concerns of a particular stakeholder group are likely to result in change to a plan because that group will continue to use all the political and legal processes of our society to have their concerns addressed. This is apparent in the Clyde Valley in Tasmania, where the water users are unhappy with the plan because they feel they have been unjustly treated. They have recently lodged an appeal against the plan in the courts and continue to lobby at all levels for change.

Similarly, downstream water users in NSW continue to lobby against bearing what they perceive are inordinate costs to themselves and the environment for upstream development in Queensland's Condamine-Balonne and their perception that water planning has not gone far enough to address it.

While equity and fairness in water sharing is an objective common to all jurisdictions, the methods for achieving it are not defined and seem to be left to the personal qualities of the planners, community feedback, and (in the end) to political processes at government level. We consider that further exploration of approaches to achieving distributional equity in water planning is of vital importance.

Distributional equity issues are best managed by firstly publicly acknowledging and assessing them. Measures to mitigate impacts can be identified and negotiated. Having access to a broad range of mitigation options (as in the integrated planning approach discussed earlier) is helpful. Having funding on the table from the start (as in the Central Region SWS in Victoria) where change is needed or economic impacts are likely provides for a more positive planning process and balances the discussion on trade-offs.

² Howard, J 2007, *Do stakeholder committees produce fair policy outcomes?* Proceedings of the 5th Australian Stream Management Conference. Australian rivers: making a difference. Charles Sturt University, Thurgoona, New South Wales May 2007 pp 157-162

Finally having a process for making the final decision on cost/impact sharing which is perceived to be fair (as discussed below) is of critical importance.

Building community confidence in the planning process

The viability of plans is built on community and stakeholder confidence and trust in the process. A number of practices were noted which contribute to this confidence, including:

- the use of independent panels in Tasmania and in Victoria to publicly review draft plans and public submissions
- the practice in South Australia and Queensland of pre-planning notification and information provision. These have the effect of clarifying at the start of the process what will and what will not be addressed, the status of current knowledge and how the community can engage in the process
- the use of independent scientists to undertake technical studies in Queensland, Victoria and Western Australia
- in many of the case studies, the use of expert peer review of models, scientific studies, and socio-economic assessments that formed the basis for options assessment and decision-making
- the transparent acknowledgement of the nature of the final trade-offs adopted and the risks involved, such as in the Central Region SWS and the Lower North Coast and Clyde Valley plans
- the ability in NSW to appeal an approved plan in the courts, provided the appeal is lodged within three months
- the clear statements of government policy in relation to water planning such as in NSW, Victoria and Tasmania, which set out principles and 'ground rules' for planning from the start
- the ability for the community to make submissions and the public recognition and response to those submissions as, for example, in the Burnett Basin in Queensland and the Central Region in Victoria.

Nevertheless, we consider that there is yet a lot of room for improvement. Further exploration of alternative options for increasing the transparency and objectivity of trade-offs and final decision-making would be of particular value. Transparency in trade-offs would benefit from greater public involvement in assessment of options and use of decision-support systems. Other options include a full public explanation of how the environmental and resource security objectives will be met by a plan; the use of public reviews of draft plans by independent bodies prior to the final decision; the transfer of the final decision to independent tribunals; the tabling in parliament of the plan with the option of parliamentary review; and the availability of statutory appeal mechanisms. More open and objective plan making gives greater confidence in the plan and increases the likelihood of the plan being accepted by those affected.

The importance of having a clear policy framework in place prior to the commencement of water planning was stressed by many stakeholders interviewed. Victoria, Tasmania and NSW have the three most comprehensive documented policy frameworks within which water planning operates. These policies frame the objectives of water plans in a manner that is acceptable to the government (and presumably meets a broad public benefit test). The Gwydir case studies in NSW provided an example of clear and detailed policy frameworks and planning processes that came too late in the process. The lack of policy, and eventual injection late in the process, caused significant conflict, undermining what could have been a much more positive community process.

Improving community engagement

In the case studies the commonly used methods for community engagement were stakeholder advisory committees, comprising of a range of stakeholders and invitation of public submissions on discussion papers and draft plans.

Important factors in successful committee operation included:

- having a full representation of relevant stakeholder interests
- having clear up-front terms of reference so the ‘rules of engagement’ are known and understood
- providing skilled independent facilitation by a chair or facilitator acceptable to the range of participants
- providing the committee with adequate technical and administrative support
- having the committee members effectively engaging with their constituency, with information flowing in both directions.

On the other hand, committee members became cynical where agencies changed policies midstream, failed to establish policy ground rules from the start, or disregarded their ‘local knowledge’ and agreed recommendations and where committee members went outside the process to lobby for changes.

Committee members appreciated being involved in identifying options and interacting with technical specialists to test scenarios or groundtruth options, for example in the Gwydir regulated river and the Burnett and Condamine-Balonne water plans. In other cases, however, their views were sought on a solution derived within government.

While committees are a useful community engagement method, in some cases it appears that they have been used without particular forethought as to what is to be achieved and whether other approaches to engagement would be more effective. Committees are not a substitute for targeted interest group consultation or broader public engagement nor, according to both government and non-government stakeholders interviewed, should they assume the decision-making responsibilities of government. Community engagement needs to be designed for the purpose, context and stakeholder needs. Different purposes include building community capacity and understanding, identifying values and concerns, seeking local knowledge and groundtruthing data, helping to identify and assess options, resolving or reducing conflict, and building community trust and confidence in the plan. A wide range of tools can be used to achieve these ends, such as workshops, newsletters, focus groups, public submissions, public meetings, citizen juries, surveys and committees.

It is clear that there is a need for a more informed approach to community engagement, which considers what is to be achieved and determines the best approach to use in the particular circumstance. There would be value in having general principles and guidelines for effective community engagement. While it is possible to develop a menu of possible techniques to be used in different circumstances, these are already publicly accessible³. What is important is that staff gain confidence in choosing a variety of techniques where necessary and that there is a high level commitment in government to following through community engagement processes to create better decisions. It is thus important to recognise the value of community engagement in legislation and provide minimal standards to ensure basic accountability and involvement. However, overly prescriptive and rigid requirements are not helpful in adapting to different circumstances and needs. States may wish to develop generic guidelines, standards or steps tailored to their own processes.

We also consider it essential to conduct a stakeholder analysis and develop a consultation plan early in the planning process. A consultation plan developed in consultation with stakeholders and signed off at a Ministerial level clarifies commitment and expectations.

Independent and participatory evaluation of both processes and outcomes of community engagement would contribute to continuous improvement and demonstrate the value of community engagement.

Dealing with uncertainty and change

Nothing is more certain than change. If anything, the recent record drought has brought home the fact that looking at what has happened in the past is not enough when planning for the future. Nature is changing around us as is our understanding of it. Human society is also changing, not only in terms of population, distribution and demands, but also in terms of

³ see, for example, <<https://www3.secure.griffith.edu.au/03/toolbox/>>

culture and values. Sustainability – satisfying the needs of the present without compromising the ability of future generations to meet their needs – is not static. Current water plans, built on existing knowledge and values, will need to adapt or they will inevitably be discarded.

All of the case study plans are built within a framework of reviews conducted every four to 10 years. For reviews to be successful, they need to be informed by appropriate monitoring and assessment programs that identify whether the plan has been successful in achieving its objectives. There should be a direct relationship between objectives, strategies, targets and outcomes. The programs should be attuned to the risks identified in the plans. Agency staff in several of the jurisdictions reported that they were actively improving their monitoring programs to refocus them more appropriately. To date, however, most monitoring programs have been not much more than the local part of ongoing state programs. The links to the regional NRM plans and monitoring frameworks were seen as an advantage. This is an area for continuing development.

In addition, there is a need to be able to adapt and respond to changes that happen at shorter timeframes. The plans themselves can incorporate adaptability. The extent to which this is appropriate depends on the level of uncertainty in the knowledge on which the plan is based, the risks involved and whether the structured ongoing review processes are adequate. Ideally this kind of adaptability is tied to monitoring of ‘triggers’ that are set for areas where both risk and uncertainty are high. The Central Region SWS provides an example of building adaptability into the plan itself. The SWS expressly provides for annual reviews of the water supply situation with the ability to advance or delay the implementation of strategies as needed. This approach allows for planning for a worst-case scenario with adaptive implementation in accordance with what actually transpires. This is in keeping with the nationwide approach for regional NRM planning. The NSW Lower North Coast macro plan includes provision for a mid-term revision of several of the water-sharing rules based on planned research which is intended to further clarify environmental needs. Several other plans include some internal trigger-response mechanisms. Queensland water resource plans are able to provide a timeframe and trigger for review ahead of the Scheduled 10 years. Its resource operations plans provide a flexible mechanism for defining detailed operating rules of the water resource plans. The NSW Lower Gwydir groundwater plan allows for local area management rules to be applied in response to changing groundwater levels or quality. There is still plenty of room to improve the identifications of risks, tailor monitoring programs around those risks and to build adaptive response mechanisms into plans.

There is tension between need for adaptability and desire for certainty. Water users in particular have pushed for certainty – wanting hard-wired rules for water sharing for long periods, so they can invest and operate businesses with greater confidence. Ironically, the highly rigid rules approach of the NSW plans, for example, while intended to give certainty, has in fact failed to do so in the face of the current drought (worse than the drought of record upon which the plans were developed). The inflexibility of the plans has meant that several of the first round water plans in NSW have been suspended almost from the time of their commencement. The plans intentionally relied on the emergency provisions of the *Water Management Act 2000* to deal with such unanticipated circumstances, but it appears in retrospect that this reliance was more than it should have been. The Tasmanian case study plans have likewise been overridden under the pressure of circumstance. In Queensland the preparation of critical water supply arrangements for water supply schemes to apply during times of water shortage is done separately to the water planning process and therefore is not subject to public scrutiny; yet extremes in climate variation should be taken into account as part of water planning processes. There seems little doubt that a fair degree of flexibility and adaptability is needed in water management, but this potentially undermines the goal of certainty. Consideration of a wide range of possible future scenarios as part of a public planning process assists in developing contingency plans that reduce surprise and help individuals make better decisions when dealing with uncertainty.

The NWI risk-sharing framework is one way of addressing this. In simple terms, it recognises that adaptation and change are bound to occur, but specifies how (in principle at least) the risk or cost of those changes should be shared. It needs to be acknowledged, however, that certainty comes at a cost. The Victorian government seems to have accepted this reality, as evidenced in the Central Region SWS, which earmarks funding for investment in water savings or purchase of entitlements where alteration of entitlements is considered to be

warranted. NSW has recognised the NWI risk sharing framework in its legislation and attaches compensation to changes to water allocation resulting from plan changes. There is, however, no explicit recognition of the funding that may be required to implement these provisions. There is some concern that changes necessary to achieve environmentally sustainable levels of extraction will not be made, or will be minimised, in the absence of any budgetary commitments.

As a general rule, the greater the risks and uncertainty, the more the need for transparency and adaptability. There needs to be more intensive monitoring of risks, more internalised triggers for change, shorter periods between reviews allowing for adaptability, greater caution in allocating water, and more contingency planning.

Improving risk and impact assessments

A vital part of the planning process is assessing the water needs of rivers and transparently weighing up the benefits and risks of proposed strategies. We observed a variety of practices, including:

- the use of time-series models of river systems or aquifers to simulate behaviour with different rules and demands
- several robust approaches to assessing the flow needs of rivers, such as the Benchmarking Method used in the Burnett and the FLOWS method used in Victoria and in the Ord in Western Australia
- the 'traffic light' environmental risk assessment diagrams used in Queensland's Burnett plans, which provided a clear visual indication of the environmental risk of different development scenarios
- the two-dimensional risk assessment used in the NSW Lower North Coast plan to rate the risk of extraction to instream values against community dependence on extraction.
- the multiple criteria sustainability assessment used in the Central Region SWS. The sustainability assessment was most comprehensive in the matters covered (cost, effect on ecosystems, effect on greenhouse gas emissions, effect on social values, fairness, social acceptability) and was presented in a way that enabled rapid visual assessment
- the integration of water resource planning with the comprehensive value and risk assessments undertaken in NRM river health planning in the Victorian Central Region SWS.

We see a clear and high-priority need for continued investment in development of methods for assessing ecological flow requirements and risks, including improving the understanding of the resilience of ecological assets. Recognising critical thresholds is an important element of risk assessment that is only beginning to be included into planning.

Socio-economic assessments, where done, were highly variable in quality; or they were completely absent. The guidelines for socio-economic analysis produced by the NSW Department of Natural Resources are a useful resource. They clearly differentiate between:

- assessments done early in the planning process to profile community and industry characteristics, allowing them to act as a baseline
- an assessment of socio-economic impacts of options or scenarios.

The guidelines enunciate desired outcomes and quality standards for each step of the process. Development of methods for assessing *community* resilience to change in water access or availability (in addition to irrigation industry dependence on water availability) would improve the credibility of rapid assessment techniques and socio-economic assessments. Greater use of socio-economic assessments of the impacts of different scenarios and alternative strategies for achieving outcomes would contribute facts and objectivity into controversial decision-making, not only improving decisions, but alleviating stress and conflict. It would also highlight priority areas for mitigating or compensating for impacts.

We also consider that the continued development of multiple-criteria assessment tools is needed to bring together the myriad of factors needing to be considered. In addition to the

traditional environmental and economic impacts, these should address such things as procedural and distributional fairness, community wellbeing and effect on social values.

Several jurisdictions have put significant effort into including Indigenous values into the water planning process. The Indigenous Working Group for the Burnett plan and the processes used in the Ord in Western Australia and Daly in the Northern Territory for identifying Indigenous values are examples. However, knowing how to integrate the holistic Indigenous interpretation of landscape into water planning the way it is currently done, separate from other NRM planning, is a real challenge. This highlights one more reason for better links between regional NRM planning and water planning.

In some plans, such as the Burnett plan, Indigenous values were translated into protection of specific features such as waterholes. The NSW water sharing plans, though, provide both a broad and specific approach. They recognise that Native Title rights may increase during the term of the plan as a result of the granting of Native Title rights under the *Commonwealth Native Titles Act 1993* and that provision of water for the satisfaction of those rights should occur. They also provide for new Indigenous cultural access licences of up to 10 megalitres per year per application and, in some areas, commercial licences for Indigenous people.

Handling surface water - groundwater connectivity

Handling of the interaction between surface and groundwater in the case studies varied. In several, a cursory assessment concluded it was not significant. The South Australian Padthaway plan expressly identifies and takes account of returns of water from irrigation to the aquifer by deep penetration. The intention is to have special volumetric allowances for higher recharge irrigation methods (for example, flood irrigation) that would not be tradable and would only apply while that method of irrigation is being used.

Rather than attempting to numerically quantify the interaction, some of the plans make broad assumptions about connection and set up management arrangements accordingly. In the Northern Territory's Katherine/Tindall plan, it is logically assumed, that *all* dry season flows in the Katherine River are derived from groundwater, and the plan is built from this basis. In the NSW Lower North Coast plan, an analysis was done of the types of aquifers in the plan area and the level of connection with surface waters. In consideration of this, a decision was made to include the up-river alluvial aquifers into the same plan as the surface water, assuming a full connection. The result is that licences to extract water from these aquifers are in many respects treated the same way as surface water licences in the same area.

Further development of approaches to identifying and categorising surface water – groundwater linkages based on the level of connection is needed as are ways of addressing this in allocation planning.

Providing the needed human resources

Funding for and availability of appropriately skilled human resources for planning and associated tasks was an issue raised by interviewees in many of the case studies. In several of the case studies, agency staff were forced to short-cut processes and assessments because of funding constraints.

In Queensland, agency staff commented on the difficulty of retaining skilled people and on the need for greater recognition of the specialist skills needed. Concern was expressed about the demanding timelines and stress, which both affect staff turnover. Stakeholders in South Australia felt that the continual turnover of agency staff caused delays and inconsistencies in information and approach. They noted that it took a while, up to five years, for staff to gain the respect and trust of the community. In some cases, staff felt that lack of resources reflected on their ability to do a professional job. The availability of a pool of appropriately skilled people provided with adequate resources was identified in most of the case studies as a critical issue. Stakeholders in several areas were also critical of the government's underfunding of plan implementation. It was noted by interviewees that water plans actually create more work rather than reduce it. Plan implementation required an expansion of resourcing to address further information, investigation and monitoring issues raised in the process. It was observed by many interviewees that governments do not have a realistic understanding of the resources needed to develop and implement water plans.

A depth of experience and skill in the technical areas such as hydrology, hydrogeology and ecology is essential, and there is some concern that, in particular, the hydrology and hydrogeology skills and experience in Australia will not be sufficient to meet future demands.

While training courses exist for technical areas such as hydrology and ecology, there is also a need for training in water planning itself. Broadly, planners need to understand how to apply generic strategic planning principles and practices to water planning, while also understanding enough of the technical aspects to be able to pull them all together. Training should also encompass developing strategies and targets that can be measured; practical use of assessments of socio-economic impacts and how to integrate assessments; taking account of Indigenous, cultural and other public benefits such as recreation and fishing; and using decision-support systems interactively with the community and in an integrated way.

Practical skills training for water planners in community engagement is needed to build confidence and expertise in applying innovative ways of engaging the community and dealing with contentious issues. Topics might be: the range of methods of engagement, facilitation, dispute resolution techniques, use of local knowledge, and tools for use in trade-off analysis. There is, to our knowledge, no textbook on water planning.

There is, then, a broad need to face up to the human resourcing needs of water planning processes and to address both the skills and funding gaps.

Conclusion

Water planning is not yet a mainstream activity like town planning. While there are many courses relating to specific scientific and technical matters that are important for water planning, none exist for water planning itself. Water planners are largely technically trained people who have been thrown in at the deep end and who have learned by doing.

While water planning has aspects in common with other types of land use or natural resource planning, Australia's variable climate and streamflows make it a unique challenge. No other type of natural resource planning has to deal with a resource that fluxes from day to day and year to year, is often difficult to define in terms of its extent, incorporates rights to shares in a consumptive pool, is vital for ecological health, regional economies and communities, and it is a fundamental requirement for human life.

It is evident that water planning will not be a one-off process. The impact of climate change means that there is even less ability to predict and plan water resource use with certainty, so an adaptive approach to water resource management and planning is required. As the recent drought has brought home to many, water is vital for our environment, our economy and our very lives. Never before has the need for effective water planning been more starkly obvious. We have still to come to grips with what ecological sustainability means and how to achieve it in a fair and equitable way. There is little doubt that future revisions of current water plans will look very different to these initial plans.

This study has identified a range of noteworthy practices in the case studies – all worthy of emulation in other areas. It has also identified a number of areas for development through research and through changes in current approaches set out in legislation and policy. It is hoped that this study will provide a catalyst for further work and for the development of a discipline of water planning that leads to ongoing improvement in this most vital area for the nation's future.