CHAPTER

FUTURE CHALLENGES 19

B.T. Hart[*,†], J. Doolan[‡], S.E. Bunn[§], A. Horne[¶], C.A. Pollino[**], R. Rendell[††], A. Webb[¶]

Water Science Pty Ltd, Echuca, VIC, Australia[*] Monash University, Melbourne, VIC, Australia[†] University of Canberra, Canberra, ACT, Australia[‡] Griffith University, Brisbane, QLD, Australia[§] University of Melbourne, Melbourne, VIC, Australia[¶] CSIRO Land and Water, Canberra, ACT, Australia[**] RM Consulting Group, Bendigo, VIC, Australia[††]

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INTRODUCTION

Australia's approach to water resource policy, planning and management has evolved considerably over the last 100 or so years. Throughout this evolution, a dominating theme has been the need to secure water supplies and buffer the effects of drought, which is a constant feature of our highly variable climate.

The Australian water resource reform journey commenced in the late 1800s under Alfred Deakin. In establishing a federated Constitution, Deakin ensured that ownership of water was vested with the Crown and that the management of water resources was the responsibility of state governments. Following this, state laws were enacted governing basic water allocation and water delivery.

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Following this establishment phase, the key focus was on building water infrastructure to provide cities and towns with reliable water supplies, and developing irrigation networks to grow food and promote regional development. This focus on development—the "build and supply" phase—lasted until the late 1970s and it was during this period that most of the infrastructure that currently services Australia's urban and rural communities was constructed. Even in this early phase where the focus was on infrastructure development, water resource managers of the time showed considerable initiative and vision in the legislative frameworks and management systems that they established to allocate and administer the resources they then controlled. Water systems were constructed using the best contemporary understanding of the hydrology of the water systems involved, water allocation systems were put in place that reflected the variability of water availability, and basic arrangements for water measurement were put in place (e.g., using the Dethridge wheel).

This phase of Australia's water history was governed by a different set of social and political imperatives from those that exist today, and it reflected the philosophy and practices of an immature water management system. And while this early phase provided a firm foundation for contemporary water resource management, it also left a number of significant legacy issues, including large government debt, poor pricing policies, service delivery challenges and unaccounted externalities, represented as widespread environmental damage. This triggered governments, in the 1980s and 1990s, to dramatically transform the way water is managed in Australia, shifting the focus from development to pursuing productivity and efficiency within capped water allocations. This saw the emergence of a new paradigm of economically and environmentally sustainable water resource management that sought to provide a secure basis for future investment, and to yield high returns to the community.

Doolan (2016a) summarized the aims of the recent Australian water reform agenda as being "to increase the productivity and efficiency of Australia's water use and ensure the health of river and groundwater systems, whilst servicing rural and urban communities." Furthermore, she identified the following as the key areas being pursued as part of this reform agenda:

- Transforming water allocation and establishing water markets,
- Improving environmental management,
- Reforming pricing of water services,
- Modernizing institutional arrangements,
- Ensuring community and stakeholder engagement in all reform processes,
- Improving water information and water knowledge.

As documented in this book, there has been substantial, wide-ranging reform over the past three decades in Australia in all of these key areas, with clear and demonstrable outcomes.

However, despite the major gains that have been made over the last 30 years, it is clear that there is still a need to maintain the focus, commitment and pace of water reform if we are to manage water to support a healthy environment, a prosperous economy and thriving communities into the future (ATSE, 2015).

Australia is facing a number of challenges that will continue to have major implications for water resource management. In our view, the five biggest challenges to water management over the next three decades to 2050 will be: *climate change*, *population growth*, *water-energy interactions*, *increasing community expectations and demands*, and *maintaining affordability*. These are not the only challenges. Nevertheless, it is inarguable that these five areas will present significant challenges over the coming decades.

These challenges will demand new trade-offs and create new policy dilemmas that will require the same attention and effort in decision making that has prevailed for the past 30 plus years. And they will create a sixth challenge—that of *maintaining the impetus for and commitment to water reform in the future*.

In the sections following, these challenges are briefly described to provide an indication of the scale and seriousness of the issues faced. We then discuss how the challenges will influence future decision making in rural, urban and environmental water management, as managers and researchers search for solutions to these pressing issues. In our view, the responses to these challenges will form the basis for the next wave of water reform in Australia.

KEY CHALLENGES FOR AUSTRALIA

CLIMATE CHANGE

Australia, in common with much of the rest of the world, is starting to feel the effects of a changing climate. Over the next 30 years to 2050, we face the prospect of increased variability as *climate change* starts to really bite. The most recent climate change projections predict that Australian average temperatures will continue to increase in all seasons, with more hot days and warm spells (CSIRO & BOM, 2015, 2017). This will be accompanied by a continuation in the current trend of decreasing winter rainfall. In southern and eastern Australia, there will also be changes in the seasonality of rainfall with predicted decreases in spring rainfall and possible changes in summer and autumn. In these areas of the country, there will be a consequential significant decrease in stream flows and increase in the frequency and severity of droughts, accompanied by an increase in the intensity of storms (BOM, 2016; CSIRO & BOM, 2015, 2017; Leblanc et al., 2012). It should also be noted that recent research has shown that postdrought the volume of runoff generated from a rainfall event does not necessarily return to the predrought relationship (Saft et al., 2015, 2016). Also of relevance for coastal cities and towns will be the continued rise in sea levels and the increase in the height of extreme sea-level events (Milly et al., 2008).

The specter of less runoff, warmer temperatures, more frequent, more intense and longer droughts, more intense storms and potentially less frequent but bigger floods will raise significant challenges for the environment, agriculture (particularly irrigation) and urban centers in Australia. This will be accompanied by a predicted increase in wildfires and changes in vegetation distribution as the climate changes, which will also modify runoff and stream flows.

The Millennium drought (1997–2009), which was followed by some of the biggest floods on record for much of the country, provided Australia with "real life" experience of the challenges that climate change will create for water management in each of these sectors (Kiem, 2013; van Dijk et al., 2013). Some have argued that the reason irrigated agriculture in southeastern Australia handled this drought relatively well was a direct result of the reforms that occurred prior to and during the drought (Doolan, 2016b, 2016c).

For urban water management, the Millennium drought made clear the increased uncertainty regarding the reliability of future water sources and the need to develop new and innovative ways to ensure water security (Head, 2014). Also it made clear the problems with using conventional predictive models based on historical rainfall/runoff data that perform poorly in capturing extremes (see Chapter 5).

POPULATION GROWTH

Australia's population is projected to increase to between 36.8 million and 48.3 million by 2061, and to reach between 42.4 million and 70.1 million in 2101, representing an increase of 1.4% over this period (ABS, 2016).

These increases in population will be mainly felt in the capital cities and regional centers. For example, the population of greater Melbourne is predicted to increase from 4.5 million in 2015 to somewhere between 7.6 million and 9.8 million by 2061 (ABS, 2016). The Victorian government, in their recently released Victorian Water Plan, is planning for a state population of 10.1 million by 2050 (DELWP, 2016a, 2016b).

The expected population increases over the next 30 years, coupled with climate change, will challenge water managers in several ways. Urban water managers will be required to at least maintain the level and standard of water supply, wastewater management, flood protection and environmental outcomes that they currently provide to cities and towns that will be growing rapidly. However, as these urban areas grow, communities are also increasingly appreciating and valuing "liveability." This has real implications for urban water management because water plays a critical role by providing for green spaces, recreational areas, wetlands and streams, and urban cooling—all of which have been shown to be important in maintaining mental and physical health and well-being (DELWP, 2016b).

Population growth will also have significant implications for rural water management, as there will be an inevitable increased demand for more food to meet the needs of the larger domestic market. This is expected to drive increased agricultural activity in the Murray-Darling Basin and the growth of other key irrigation areas across the country.

WATER-ENERGY INTERACTIONS

In Australia, the water sector uses about 45 petajoules of energy for transporting water, representing about 1.4% of all Australia's energy use (Apostolidis, 2012). This use of energy results in the emission of greenhouse gases through two pathways:

- *Indirect emissions* through the use of energy to pump water around, to treat water and wastewater to safe standards, and to heat water in houses;
- *Direct emissions*, particularly from wastewater treatment plants.

In Victoria, the water sector emits almost 1 million tonnes of carbon dioxide equivalents each year and is responsible for almost 25% of the emissions from all government activities in that state (DELWP, 2016b).

As governments seek to meet international obligations and reduce carbon emissions, there will be requirements for the water sector to do its part. As part of this, there are now major moves to reduce both energy use and costs in the water sector (WSAA, 2012). For example, the Victorian government has committed to a long-term target of net-zero greenhouse emissions by 2050. In line with this, the recent *Water for Victoria* plan requires the four metropolitan water authorities to examine a pathway to achieving net-zero emissions by 2030, with all other water authorities plotting pathways to meet the 2050 target (DELWP, 2016b).

The urban water sector has already reduced emissions by developing more energy-efficient equipment, capturing biogas for energy generation, and investing in renewable energy generation, particularly where these have been cost-effective business decisions. However, as they seek in the future to augment water supplies with alternative, non–climate dependent water sources (e.g., desalination plants), they will be faced with a dilemma in that the energy use associated with these sources is often greater and more costly than that for more traditional water sources.

In irrigated agriculture, as irrigators seek to improve their water efficiency by using technology, such as pumping and systems like drip irrigation, they will find that these use more energy. In this area of water-energy interactions, there is often a trade-off between improving water efficiency and increasing carbon emissions, and a further trade-off between reducing carbon emissions and the cost of service provision.

INCREASING COMMUNITY EXPECTATIONS AND DEMANDS

Water managers in the future will have to deal with an increase in the expectations and demands of the community. The Millennium drought in Australia showed very clearly the social dependence on and importance of water in both urban and rural environments. During the drought, local lakes and streams dried up in rural areas (often for the first time) and urban communities were on stringent water restrictions for extended periods (sometimes years) with very limited water available for parks and private and public gardens (Doolan, 2016c; Lindsay et al., 2016). The communities in all major capital cities responded very positively to the need for water conservation and changed their expectations around what was an appropriate use of water (Lindsay et al., 2016). Also during this period, rural communities became increasingly aware of how important those environments were for amenity, regional tourism and recreation, and how much influence they had on local economies, liveability and social well-being.

It is inevitable that communities will expect more from their water services as they look towards a future with less water. In urban areas, this will include the capacity to maintain green spaces, recreation areas and water environments, even during periods of extended drought. Thus, as our cities become larger and more highly urbanized with population growth, the effective use of water will become even more important for maintaining liveability and social well-being.

In rural areas, there is often pressure to use environmental water to maintain environments of local economic or social importance. In many cases, this can be compatible with good environmental outcomes, but this is not always the case. On occasions, managers will be required to work through some difficult trade-offs.

These increasing expectations and demands will require innovation from all water managers—urban, rural, and environmental—to get the utmost benefit from an increasingly scarce and valuable resource. Solutions will need to meet their primary requirements, but also maximize secondary environmental, social or economic benefits for their communities. As we move into the Information Age, this will be achieved through improved access to data, both at the site and national scales, which can lead to real-time decision making and greater transparency of the risks and benefits of water to both managed and unmanageable parts of the system. The challenge for water authorities will be to provide sufficient amenity value from reduced amounts of water, and to do it in a way that does not increase the cost to do this.

A final area where there is a significant increase in community expectations and requirements is from our indigenous communities. To date, Traditional Owners have had very little involvement in decision making on water management despite having a significant dependence on and great knowledge about water in Australia. In recent years, there has been a major drive from these communities to take a greater role in water management, seeking access to both the consumptive and nonconsumptive pools to improve cultural, social and economic outcomes for indigenous communities (MLDRIN, 2009; FVTOC, 2014; NNTC, 2014). While work in this area has commenced with recent Victorian government commitments (DELWP, 2016b), the granting of cultural access licenses in NSW water

sharing plans,[1] and initiatives such as the National Cultural Flows Research Project[2] and the Living Murray Indigenous Partnerships Program,[3] progress has been slow and it remains an ongoing issue for the future.

Thus, a further challenge will be how to deliver indigenous access to water for cultural reasons and economic development, and to increase the participation of Traditional Owners in water planning and management over the coming decades.

AFFORDABILITY

A key objective of water reform in Australia has been to ensure that the water industry is financially sustainable, achieved through the introduction of cost-reflective water pricing (see Chapter 1). Thirty plus years of water reform have seen this objective largely achieved in metropolitan areas, mostly achieved in other urban areas and significant progress made in irrigation in relation to the costs of service provision. However, there is still some debate about what this actually means, e.g., the current policy settings do not include full accounting of environmental externalities or any form of resource rent and there are still differences about how assets should be valued. How this is done is still a challenge, with techniques such as nonmarket benefit valuation and ecosystem services showing some promise.

Regardless of any future policy directions, current policy settings have seen water prices increase. In particular, prices in urban areas have significantly increased over a short period of time to pay for large-scale augmentations (e.g., desalination plants) undertaken in response to drought and population growth. This has put significant pressure on households that are also dealing with cost-of-living increases associated with rising cost of electricity and gas, and other cost increases.

Prices for irrigation services have also increased, although not to the same extent as in urban areas. Moreover, as new water-efficient technologies for farms and irrigation systems are introduced, water savings occur but recurrent costs increase. For new irrigation enterprises, the initial purchase of their water entitlement is also a consideration, as water entitlements must now be bought on the water market. Water entitlements are now a key capital cost for irrigated agricultural businesses, with the value of water being around 50% of a rice property, 40% of a dairy farm and 30%–35% of a horticulture farm (Rob Rendell, RMCG, Pers. Comm. Jan. 2017).

Given the preceding discussion, affordability has become a real focus for governments and, as a result, continues to be a significant challenge for the water industry as it looks to deal with the challenges of climate change, population growth and increasing community expectations.

FUTURE DECISION MAKING TO ADDRESS THESE CHALLENGES

Water resource managers are adaptively dealing with the challenges of implementing the existing national water reform agenda, responding to a variable climate, changing community expectations and political environments. The challenges described in this chapter add new and emerging issues and new dimensions to water resource decision making. In the sections following, we describe the key issues and decision-making challenges that will be posed for each of the urban, rural and environmental water management sectors.

[1] www.water.nsw.gov.au/watersharing plans.
[2] culturalflows.com.au/.
[3] www.mdba.gov.au/aboriginalpartnershipprograms.

URBAN WATER MANAGEMENT

Over the next 30 years, urban water managers will need to provide water supply, sewerage and liveability services for rapidly growing cities and towns in a much drier climate, while cutting carbon emissions and with their water prices under strict scrutiny.

This raises several key issues for urban water policy and management, including:

- *The need to develop a diverse range of water sources while making the most from existing water supplies*, e.g., using variably treated water to suit alternative uses. Current policy settings and community attitudes do not always support this approach, with community debates about what should be allowable uses for stormwater and recycled water. As housing density increases in cities, the opportunities for cost-effective, fit-for-purpose use decrease (with smaller gardens or no gardens at all). In large coastal cities, desalination is one climate-independent option for augmentation of urban water supplies, but the excessive energy requirements pose a related challenge. Managed aquifer recharge of stormwater is also being explored at scale, but pretreatment costs can be high. Increasingly, cities and towns are looking to groundwater or surface water trading for their next augmentations, particularly where available catchments and aquifers are at their sustainable diversion limits.
- *The role of the water industry in providing water to enhance liveability*:
  - **(a)** *Water availability*—There is real potential to manage stormwater to more effectively provide green spaces and improved water environments. However, this is frequently a costly option and it is difficult to retrofit older urban areas. Stormwater management is also complicated by boundary issues between planning departments, local governments and water managers. Rather than broad-scale approaches, local recycled water systems can augment water supplies. As these schemes are developed, it will require governments to define roles and responsibilities in the new area of provision of "liveability" services, determining cost-effective and efficient mechanisms of augmenting water supplies, including being prepared to allow higher prices or higher rates to pay for them
  - **(b)** *Integrated planning*—In most urban centers, land use planning and urban water planning are not (or poorly) integrated, with the result that opportunities for innovative, resilient, and cost-effective water system development in the (extensive) new growth areas are lost. Significant institutional and regulatory reform is needed to address existing barriers to integrated planning, taking into account objectives across multiple domains such as water security and housing affordability.
- *Setting standards for services* particularly during drought, including understanding the role of water conservation and restriction policies in the provision of water supply. Once again, this will result in a trade-off for communities between water security and water price.
- *Moving to carbon neutrality* will involve initially making sensible business decisions to reduce electricity consumption or to generate their own electricity. Many of these "low-hanging fruit" decisions have already been taken. In future years, low carbon operations will require innovation and will probably cost more to run, again reflecting the need for careful consideration of implementation strategies to mitigate impacts on water prices.

Given all of this, there will be an ongoing imperative for urban water managers to improve their operational and economic efficiency. This includes examining the issue of the role of the private sector in

providing urban water services. Currently, urban water services in Australian urban centers are largely provided by government entities, although they may contract out significant components.

While much of this future will be highly challenging, it will also create an environment for real innovation, which will see the emergence of new technologies and improved local integrated solutions to water and liveability issues.

RURAL (IRRIGATION) WATER MANAGEMENT

Over the next 30 years, irrigators will need to increase productivity to provide for a growing population, but in a drier climate and within established limits on the amount of available water (sustainable use limits). The imperative will be on the irrigation industry to continue to become more efficient, carrying on the trend of "producing more with less water." This is entangled with correctly valuing agricultural products, ensuring primary industries, such as the dairy industry, can remain profitable and continue to invest in best practice of water use and treatment.

In the Murray-Darling Basin, it seems likely that successful irrigation industries will need to optimize the mix of enterprise types with an eye to maximizing production in a highly variable and drying climate, and to provide sufficient flexibility to operate within wetter and drier climatic periods. For example, in drier years, the market will drive the available water to enable the higher-value enterprises (e.g., horticulture) to be sustained, but at the temporary expense of lower-value crops. This will result in irrigation enterprises needing to make smart business decisions that trade off between crop type, crop yield and water reliability. Technology, including access to real-time sensor network data and reliable forecasting, has a great potential to help rural industries make better decisions.

In the Murray-Darling Basin, it is highly likely that the value of water will rise in line with the value of production. This will create a greater driver for efficiency in all aspects of water management, including river operations and environmental water management. It is inevitable that the system will be managed adaptively, and knowledge gaps will be addressed where possible. As well, multiple benefits of water use and management will be sought and communities will become empowered as part of decision processes.

One likely future is that irrigation authorities in the Murray-Darling Basin will have to cope with the challenge of delivering less water with existing infrastructure in an increasingly variable climate. This will put increased pressure on the price for irrigation services, the customer's capacity to pay, and the financial viability of irrigation enterprise. This is a trade-off that has been a constant in Australian water management for the past 100 years, but is likely to become more acute.

Increasingly, there will be pressure to better manage catchment water sources (both surface and groundwater), storages and delivery pathways for consumptive, environmental and cultural (indigenous) uses. This will inevitably see the development of new methods for balancing the needs and desires of irrigators, local communities, Indigenous groups and the environment. It will require better understanding of community values and perspectives, and allowing them to participate in decision making.

Outside the Murray-Darling Basin, there will be pressure to grow production from other major irrigation schemes, which remain unprofitable at this stage. In addition, there will be a push to achieve higher environmental standards and meet targets for diffuse pollution in critical catchments, such as those that discharge to the Great Barrier Reef.

Once again, while much of this is challenging, it is an area where innovation and improvements in forecasting, smarter river operations, farm and system delivery technology and crop types and yields, will make a substantial difference.

ENVIRONMENTAL WATER MANAGEMENT

The next 30 years will pose significant challenges for water, people and the environment. Climate change will mean that there is less water within the landscape overall. Unregulated rivers and lake systems will dry more frequently. Hart et al. (2017a) have shown that, given the current policy settings (at least in the Murray-Darling Basin Plan), the environment will bear the brunt of a drier climate, receiving disproportionately less water. Additionally, the sequencing of wet and dry spells, both preceding and within a drought, can significantly influence ecological outcomes during the drought period, but results in only minor changes to consumptive allocations (Wang et al., 2017). In regulated systems, where environmental water managers hold water entitlements, there will be more opportunity to mitigate the impacts of climate change. Groundwater dependent ecosystems will also be subject to change with reduced recharge of aquifers. Moreover, there will be significant and increasing pressure to get as many social and other community benefits as possible from the use of this water. This could include water for recreational and amenity purposes.

In urban systems, as cities and towns grow, the challenge will be to maintain or improve stream and wetland health. This will be particularly challenging in existing urban areas, but offers many opportunities in new "greenfield" growth areas. In the latter, new ways to capture, treat and utilize stormwater and domestic wastewater for environmental benefit are already occurring, and are likely to expand (City West Water, 2016).

Climate change will bring several difficult issues for environmental water policy and management including:

- *Determining environmental objectives for managing rivers, streams and wetlands under climate change*. With the pressures placed on many of our river and wetland systems due to climate change, it will be necessary to become far more sophisticated in setting management objectives to meet future community needs. It will mean managing systems to ensure they have the greatest chance of adapting to a drier climate rather than looking backwards at what they were (e.g., pre-European state). This will be challenging in resolving the balance between environmental values and the need to provide for the community's social, cultural and economic requirements. This is an anthropocentric view, but it does represent the reality of contemporary environmental management.
- *Improving the management of river systems for environmental outcomes*. Despite some improvements, the highly regulated sections of the Murray-Darling Basin are still managed largely to optimize consumptive water outcomes. The future challenge will be to operate these river systems with a view to optimizing the outcomes for both irrigators and the environment. For environmental water, this will require the development of new modeling tools that provide support for active management decisions and allow representation of how management decisions might change under a drying climate (Horne et al., 2017). Current models focus on long-term planning and flow targets, and not on supporting active management. Most do not perform well in estimating changes to low flows, which often have high environmental significance (see Chapter 6).

- *Demonstrating to communities that the environmental water entitlements are being managed to maximum effect*. The Australian government has made a significant investment in providing water for the environment (see Chapter 13), but not without considerable community concern about the impact this has had on irrigation-dependent communities. Thus, there is an imperative for environmental water managers, and particularly the Commonwealth Environmental Water Office and the Murray-Darling Basin Authority, to demonstrate that the investment in environmental water has benefited the environment. This will be a significant challenge given that environmental recovery can take a long time to become apparent.
- *Improving the methods for measuring the social, human-health and indigenous benefits of environmental flows*. There is some research around the benefits of healthy environments for mental and physical health of resident populations. But currently, these values are not seriously considered in the assessment of benefits of environmental watering. The challenge will be to develop improved methods for assessing the broader societal benefits of environmental water, and with this to improve the case for retaining and, where necessary and agreed, increasing the volumes of environmental water.
- *Ensuring that associated complementary tasks of habitat restoration, water quality management and catchment management are maintained to maximize the value gained from environmental water*. There is potential for these essential activities to be downplayed compared with the focus on the provision of water for the environment, and particularly as the amount of that environmental water is reduced due to climate change. It will be a challenge to maintain these complementary management activities into the future to ensure the desired environmental outcomes are achieved.
- *Developing an understanding within the community and governments that these environmental assets underpin the economy and well-being of Australian communities*. If this can be achieved, the case for long-term management and investment regimes, similar to those existing for other water infrastructure assets (e.g., reservoirs), will be easier to achieve. In Victoria, an environmental contribution is legally required from water authorities to assist in the long-term funding of waterways management and monitoring.[4]

Again, while these are challenging issues, there are also opportunities. There are real opportunities for river managers and other water users to work together to optimize water delivery and get the best environmental outcomes and efficient delivery of irrigation water. Already investment in environmental "works and measures" has resulted in enhanced environmental outcomes with less environmental water[5] (DPIE, 2013; NSW-OW, 2013), although these investments are not without some criticism (Pittock & Finlayson, 2013). Additionally, the Australian and state governments have developed a "constraints management strategy" aimed at reducing some of the major constraints to more efficient environmental watering in the Murray-Darling Basin (MDBA, 2013). A key plank in this strategy is the minimization of constraints (e.g., levees, flooding of minor bridges, flooding of agricultural land) that are preventing more water getting onto floodplains. Again, this strategy has run into considerable local opposition in some regions.

[4] www.depi.vic.gov.au/water/rivers-estuaries-and...implementation-and-monitoring.
[5] www.agriculture.gov.au/water/mdb/programmes/.../environmental-works-measures.

A FINAL CHALLENGE—MAINTAINING THE MOMENTUM AND COMMITMENT TO WATER REFORM

The preceding sections show clearly that the need for ongoing effort in water reform in Australia is still required, even after three decades of concerted effort. Indeed, there is unlikely to ever be an "end" to water reform, with a constantly evolving human and natural environment requiring an ongoing effort to continuously reform and improve water management. This, in itself, will be a challenge. As Australian water managers have found, water reform is complex, hard, politically challenging and resource intensive and can only proceed at a pace that the community can adapt to (Chapter 1; Doolan, 2016a).

In some areas of Australia, the combination of water reform (including the Murray-Darling Basin Plan), the Millennium drought, increasing fuel and energy costs, and fluctuating commodity prices have created conditions where there is considerable community hardship that is being attributed to the Basin Plan specifically and water reform more generally.

Conversely, however, the Millennium drought created the conditions where communities and politicians were more prepared to make the effort to make major advances in water policy and management. These greatly increased the efficiency of water use. However, since the breaking of the drought in 2010, there has been some increase in per capita water use in urban environments (although nowhere near predrought levels), and politicians arguing that environmental allocations need review. It is clear that the drought provided a major point of focus (a crisis) that, with the groundwork laid over the previous two decades, allowed further progress in water reform to be made.

The challenge therefore is to maintain momentum for water reform, particularly during wetter periods when the need for reform is not so obvious, and when the increased costs that might come with a different approach to water management might not appear justified to those focused on the short-term availability of water.

Additionally, community controversy and backlash can affect the political will for further reform, and because of this water reform can easily be moved to "the back burner" for governments. All parties can be (either separately or mutually) fatigued by the ongoing conflict, resulting in a decreased appetite for any further reform.These issues highlight the importance of ongoing community and stakeholder engagement, obviously in the development of policies, but also in their implementation where community attitudes can change depending on their circumstances. This requires a capacity to adapt to and manage such changes.

Further, governments have spent significant amounts of money on water initiatives. For example, the Australian government is spending around $13 billion on the development and implementation of the Basin Plan alone as well as other water-related initiatives. State governments also invested heavily during the Millennium drought on water efficiencies, water for the environment, new infrastructure and drought relief. In these times of economic uncertainty and budget austerity, and without the immediate imperative of drought (a crisis), there is always a risk that governments will view water reform as "having had its turn."

Another potential issue is that the current generation of water managers and key water stakeholders who were responsible for developing and implementing the reform agenda over the last 30 years are retiring and moving on. The key agencies are also being "hollowed out" due to restructuring and downsizing. It is imperative that this huge body of institutional knowledge, as well as "the fire in the belly" for reform, is passed on to the next generation of water managers to ensure that the

economic, social and environmental gains from past reforms are not lost, but are built on for greater future benefits. There are some excellent signs that this is occurring, with the emergence of a younger generation of water planners and managers.

Despite the difficulties, governments are recognising the need for continued reform. The Victorian Government recently released its *Water for Victoria—Strategy* (DELWP, 2016b), which outlines water reform over the next 10 years in that state. It is to be hoped that 13 years after the National Water Initiative (NWI), the other state and Australian governments will not only maintain their commitment to the existing national water reform framework but will also recognize the need to review, renew and extend their own water reform programs and the collective national agenda.

A key test of this for the Australian government and the northern states of Queensland, Western Australia and Northern Territory will be to ensure that the new developments planned for northern Australia (Aust Govt, 2015) are undertaken within the policy framework of the National Water Initiative (NWI). Hart et al. (2017b) have stressed the crucial importance of water in underpinning any sustainable irrigated agricultural activities in the north, and have discussed the key aspects that will need to be addressed in developing a robust, transparent and coordinated water resource planning process to support sustainable irrigated agriculture in northern Australia, based on NWI principles. Others have also commented on the need for strong governance regarding these developments (Humphries et al., 2017; Stephens et al., 2015).

CONCLUSIONS

This book has sought to summarize the key aspects of the Australian water reforms over the past 30 years, and to capture the learnings from them, particularly those elements that have contributed to improved decision making. This collective review and analysis of the Australian experience should assist in advancing the decision-making process in water resources policy, planning and management, both in Australia and overseas.

As a developed country, with demonstrated experience in decision making in water resources management, Australia has some capacity to assist other countries, particularly developing countries, in their water resources management journeys. This may become more useful, as our region becomes drier and hotter, with less water, and therefore greater water scarcity.

Australia also has an opportunity to contribute to water reform on the world stage. In a recent (December 2016) and important move, the United Nations declared the *2018–2028 Water for Sustainable Development* decade to raise awareness of the critical state of water resources around the world and to inspire more action.[6] This represents a significant opportunity for Australia to play a role in helping other countries achieve their sustainable development targets for water.

The preceding sections in this chapter have identified the key issues that in our view will need to be addressed in the next wave of water reform in Australia. Working through these issues and trade-offs will require the same attention and effort in decision making that has prevailed for the past 30 years. It will require the same or greater level of commitment to community and stakeholder engagement.

[6] http://www.tajikistan-un.org/2-uncategorised/104-adoption-of-a-resolution-entitled-international-decade-for-action-water-for-sustainable-development-2018-2028.

It will require a much greater level of partnership with Traditional Owners than we have had previously and it will require continued investment in knowledge and information to ensure that future decision-making processes are based on the best evidence available.

Australia has had considerable success in the past with water reforms. What is required in the future is the acknowledgement from governments and communities of the benefits realized, and the social, political and legislative license to press on with the difficult and ongoing task of further water reform.

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