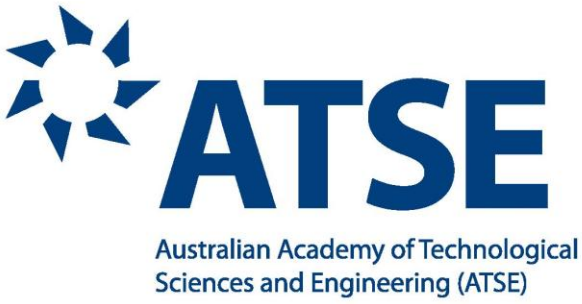

Public Inquiry into

AUSTRALIA'S URBAN WATER SECTOR

A submission by the

Australian Academy of Technological Sciences and Engineering (ATSE)

to the

Productivity Commission

5 November 2010

Australian Academy of Technological Sciences and Engineering

Submission to the Productivity Commission Inquiry to Australia's Urban Water Sector

The Australian Academy of Technological Sciences and Engineering[1] (ATSE) is pleased to respond to the Productivity Commission's public inquiry into Australia's Urban Water Sector.

Summary

The following observations are made:

- The Academy believes that it is essential that communities in urban areas have access to a reliable, consistent water supply congruent with the agreements made between the Commonwealth and States/Territories through the Intergovernmental Agreement on the National Water Initiative.
- It is recommended that authority for overarching water policies including those responsibilities deriving for water reform (primarily with State/Territory Ministers) be clearly allocated to an on-going Ministerial Council backed up with appropriate policy and technical skills.
- It is considered that the further aggregation of small municipally owned water utilities should be encouraged in New South Wales and Queensland as was undertaken in Victoria in the 1990s and more recently in Tasmania. There may be a need to consider such changes within a broader framework of local government reform. Even before any major changes are initiated, every effort should be made to induce existing service providers to improve their performance in terms of efficiency, service delivery, assessment of risk, security of supply, in cooperation with other suppliers.
- A better definition of stormwater flows in urban areas and the proportion of them that can be available for access as a consumptive resource should be undertaken.
- Further research should be undertaken into the suitability of treated urban stormwater for addition to the drinking water system.
- It is concluded that there is considerable scope for the States to reform how water services are provided and how the planning is undertaken that ensures water utilities have access to, or have the ability to purchase, additional bulk water entitlements when required.
- The Academy supports the National Water Commission's view that the introduction of treated recycled water into the drinking water supply (i.e. purified recycled water [PRW]) is an important option to improve Australia's long-term water security and should be considered on its merits.
- The community as a whole needs to be encouraged to have a better understanding of the water cycle.
- Planning systems should embrace an integrated "whole of landscape" approach – rather

[1] The Australian Academy of Technological Sciences and Engineering is an independent body of 800 eminent Australian engineers and applied scientists driving technological solutions for a better Australia.

than having discrete planning systems that separate water management, ecology, coastal processes and land use planning at local and catchment scales.

- Access to water resources by urban water utilities should be provided under the same principles as those for other water users – namely through ownership of entitlements as determined in the 1994 Water Reform Agenda and the 2004 National Water Initiative.
- Current water resource management / water supply services separation arrangements should be reviewed as to whether they have been implemented appropriately, or whether some changes in the 1994 Water Reform Agenda should be undertaken.
- Policy-makers must ensure they consider the interdependence and integration of the policies they are contemplating, with those of other areas, including water. For example, projected policies relating to carbon sequestration or biodiversity through tree planting or woodland thickening should fully take into account the scientific interdependence of these policies with those of catchment management.
- Though not a specific urban water issue, any revision of the NWI should mandate the use of NWI-compliant language in acts and regulations as defined within the NWI and agreed by governments.
- Much more policy attention should be given to increasing the efficiency of domestic hot water heating.
- A greater focus should be placed on pricing signals that can vary according to scarcity and demand.
- Revisions to regulations and the NWI should be such as to facilitate the offering of a range of alternative water products.
- The NWC's approach to encouraging independent price regulation in those jurisdictions not yet having it is endorsed. In the longer term, there is merit in considering a national approach to independent price regulation.
- The National Water Initiative should be amended to better provide in principle for competition options to be realised.
- It is recommended that further modelling be commissioned of how water systems can be configured and owned to allow retail purchasers a choice of water supplier and/or products, and the legislative structures that may be required to achieve such an outcome.
- Consideration should be given to developing a pricing environment with a complementary regulatory environment that encourages more innovative management of wastewater at the household level.
- Any approvals for the establishment of privately operated water or wastewater plants should include an agreed approach for continuity, possibly involving a performance bond, in the event that the original operator is unable to continue.
- Modelling should be commissioned to address the alternative approaches to recycling water "fit for purpose" *vs* recycling all of it "suitable for drinking" purposes. Regulatory environments should allow either approach to be adopted on its efficiency and economic merits.

- Developing a nationally implemented consistent approach to recycled water regulation including water recycling should be addressed.
- Primary responsibility for ensuring water quality and health standards should firmly rest with the water utilities themselves with an adequacy of regulation to ensure that such standards are met.
- Cognisance of the need for ensuring that underpinning water quality science is continually updated should be built into any revision of the NWI. A survey of peri-urban and urban stream and stormwater composition would form a useful basis for such developments.
- It is considered that efforts should be made to secure some form of sanctions/rewards for use following the next NWC Biennial Assessment and any subsequent introduction of additional urban water reforms.

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SUBMISSION FROM THE AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING – URBAN WATER

The Academy

The **Australian Academy of Technological Sciences and Engineering** (ATSE) is an independent, non-government organisation consisting of some 800 Fellows, promoting the development and adoption of existing and new technologies to improve and sustain Australia, our society and economy. One of four learned Academies, ATSE was founded in 1976 to recognise and promote the achievements of Australian scientists, engineers and technologists. ATSE provides a national forum for discussion and debate of issues critical to Australia's future, especially the impact of technology, science and engineering on our quality of life. Through its Topic Forums, ATSE maintains a strong interest in major policy areas including Energy, Water, Climate Change Impact and Education.

ATSE has a significant record of undertaking policy studies with regard to water. Pertinent recent reviews include:

- Water in the Australian Economy (1999)
- Population Futures (2000)
- Perth's Water Balance - The Way Forward (2002)
- Water Recycling in Australia (2004)
- Review of Water Supply Planning for Australia's non-metropolitan Urban Water Utilities (2007)
- 30/50 – An Australian Population of 30m by 2050 (2007)
- Assessment of Impacts of Climate Change on Australia's Physical Infrastructure (2008)
- The Hidden Costs of Electricity: Externalities of Power Generation in Australia (2009)
- Electricity Generation: Accelerating the Technology (2009)

All of these reports are available from the ATSE website, http://www.atse.org.au/.

ATSE's initiatives in the water arena are led by its **Water Forum**, which promotes and facilitates the contribution of experience and skills of its Fellows to influencing public policy, public education and industry in the development and adoption of optimum technological solutions to Australia's water challenges.

The Australian Academy of Technological Sciences and Engineering (ATSE) convened an International Workshop on *Water and its Interdependencies on the Australian Economy*, in Sydney on 22-23 June 2010, with funding from the Australian Government Department of Innovation, Industry, Science and Research.

The Workshop, organised by the ATSE Water Forum Leadership Group, was attended by 50 of Australia's most senior water scientists and policy-makers. It explored the relationships between water and the other key sectors of the Australian economy, in particular energy and agriculture. Challenges included were population change, urban growth and climate change. Speakers identified sensitivity to, and projections for, water demand to the year 2050 and the importance of external drivers, interconnections, and financial investment to support sustainability of their sector. The Executive Summary of the Report of the Workshop is attached at Annex A. The full report is available for download from the ATSE website.

This submission has been prepared by the Academy's Water Forum, comprising a Leadership Group, a Reference Group drawn from within and outside the Academy and 72 Fellows with an expressed interest in water policy and technology issues, taking account of the outcomes of the International Workshop and other issues. The submission is forwarded for consideration in response to questions raised in the Commission's Issues Paper for the inquiry.

Access to Water

It is essential that communities in urban areas have access to a reliable, consistent water supply congruent with the agreements made between the Commonwealth and States/Territories through the intergovernmental Agreement on the National Water Initiative (COAG 2004) which provides at clause 90 to:

i) provide healthy, safe and reliable water supplies;
ii) increase water use efficiency in domestic and commercial settings;
iii) encourage the re-use and recycling of wastewater where cost effective;
iv) facilitate water trading between and within the urban and rural sectors;
v) encourage innovation in water supply sourcing, treatment, storage and discharge; and
vi) achieve improved pricing for *metropolitan* water

There has therefore been a commitment by the States/Territories to ensure that this occurs. However, it is not implicit that the States/Territories actually have to directly undertake the operation of urban water services, though in reality, almost all services are provided by State or Local government-owned entities.

ATSE has supported a continuing commitment to the principles enshrined in the National Water Initiative (NWI). An International Workshop which ATSE convened in June 2010, involving a meeting of 50 of Australia's most senior water scientists and policy-makers, agreed that a refreshed national water reform agenda, including urban water reform, should be established by 2014, and that the new agenda should be better nested within natural resource management, energy, population, and food and agriculture policies.

It should be noted that the current NWI also refers to and gives responsibilities to structures which are now outdated, including the Natural Resource Management Ministers Council (NRMMC), whose remit has been withdrawn by the Council of Australian Governments (COAG) from March

2011. The structures under which the NWI operates until the abolition on the NRMMC are shown in Figure 1

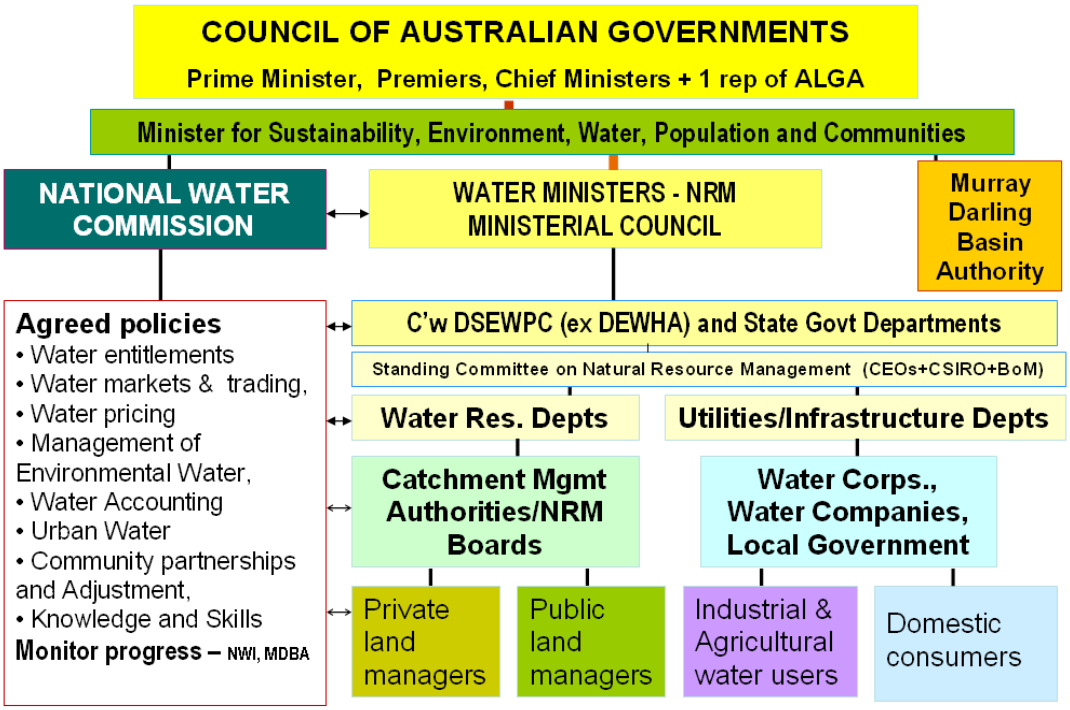

Figure 1. Structural relationships (conceptual) governing water management in Australia, 2010

The recent Primary Industries Standing Committee and Natural Resource Management Standing Committee meetings in September 2010 suggested that Ministers seek to have COAG recreate a Primary Industries Ministerial Council encompassing biosecurity and to also create an Environment Ministers Council. It would appear that, if approved, water policy could continue to be split between both Councils, with urban water policy sitting awkwardly and somewhat weakly in both.

Observations 1 and 2

The Academy believes that it is essential that communities in urban areas have access to a reliable, consistent water supply congruent with the agreements made between the Commonwealth and States/Territories through the Intergovernmental Agreement on the National Water Initiative.

It is recommended that the authority for overarching water policies including those responsibilities deriving from water reform (primarily with State/Territory Ministers) be clearly allocated to an on-going Ministerial Council backed up with appropriate policy and technical skills.

Efficiency and reliability mechanisms

The primary issue in the provision of water services is to identify mechanisms that encourage greater efficiency and reliability of both supply and use. Although there can be considerable debate, this is likely to be achieved by greater competitiveness in the supply of water services, and clearer market signals covering water use. Australia has not had a good track record in either of these areas.

Metropolitan urban water services

Over the past five years, there has been an unprecedented expenditure on developing non-climate dependent drinking water alternatives to catchment water sources. In Queensland $2.5 billion has been spent on indirect potable recycling infrastructure, while an estimated $9.88 billion is being invested in metropolitan desalination plants across Australia. The latter are summarised in table 1, giving a total metropolitan urban desalination production capability of 485GL per year.

Table 1. Capacity, location, operating commencement, operating entity and participant companies of Australian metropolitan desalination plants

Sydney –	**90GL/yr , Kurnell - 2010 - Veolia Water** (Veolia and John Holland builders)
Melbourne –	**160 GL/yr Kilcunda (nr.Wonthaggi) – late 2011 AquaSure** (Degrémont / Thiess / Macquarie Capital)
SE Queensland–	**45GL/yr Tugun, - 2009 - WaterSecure** (John Holland, Veolia Water, Sinclair Knight Merz, Cardno)
Perth –	**45GL/yr Kwinana, Dec 2006- – Dégremont** (Multiplex – Degrémont)
Adelaide –	**100GL/yr Port Stanvac – water in Mar 2011 – AdelaideAqua** (Acciona Agua, United Utilities, McConnell Dowell and Abigroup)

Non metropolitan urban water services

In 2006-7, the Academy undertook a review of non-metropolitan urban water planning (Neal *et al.* 2007). The Executive Summary of this report is provided at Annex B.

This review identified great differences in how urban water supplies were provided, as summarised in Table 2.

Table 2: Number of non-metropolitan urban water utilities in each State or territory outside Capital cities

State or Territory	Number of utilities	Approx. population served [1]
New South Wales	107	2,000,000
Northern Territory	1	77,000
Queensland	125	1,700,000
South Australia	3	400,000
Tasmania	12	330,000
Victoria	12	1,500,000
Western Australia	3	680,000
Total	263	6,687,000

[1] From a variety of sources including the Australian Bureau of Statistics (ABS) census information and water utility annual reports. These are approximate numbers for illustration purposes only and include rural areas unlikely to be serviced by water utilities.

There has since been significant reform in Tasmania and in Queensland, particularly in South-east Queensland, and minor reform elsewhere. However, the urban utility structures used for providing non-metropolitan urban water services in Queensland (now reduced to about 72) and New South Wales remain notably different from those in the other States and Territories, still being dependent on a large number of relatively small local government-owned entities. It is difficult for small water utilities to employ the technical expertise they may require and they are often dependent on consultancies for new developments. There was little evidence of long term planning in non-metropolitan NSW and Queensland and almost no consideration of such topics as the potential impact of global warming and climate change.

These observations have since been reinforced by the National Water Commission (NWC 2009) in its second Biennial Assessment of progress in implementing the National Water Initiative. It commented:

> *"Water plans are fundamental to water management because they establish a balance between environmental and consumptive uses. Under the NWI, transparent, statutory-based water plans should be developed for all surface water and groundwater management units in which entitlements to water are issued. The necessary legislative reforms have been completed in all jurisdictions except Western Australia, but ongoing delays in completing and implementing water plans across much of Australia are preventing the full realisation of the benefits of an effective water planning regime envisaged under the NWI. Over the past two years, few new plans have been finalised. Many remain outstanding (in all jurisdictions except the ACT), and timetables for their completion need to be re-established. The Commission considers it is now timely for parties to reset and republish realistic timeframes for the rollout of remaining water plans".*

Observation 3

It is considered that aggregation of small municipally owned water utilities should be encouraged in New South Wales and Queensland as was undertaken in Victoria in the 1990s and more recently in Tasmania. There may be a need to consider such changes within a broader framework of local government reform. Whether to move to a single water coordinating organisation (capable of being achieved under the Water Act 2000 (Qld) under which the Queensland Water Commission was established) is a matter for NSW and Queensland to determine after considering the technical, service and financial efficiencies that might be so achieved. Before any major changes are initiated, every effort should be made to induce existing service providers to improve their performance in terms of efficiency, service delivery, assessment of risk, security of supply in cooperation with other suppliers.

Stormwater

The impact of urbanisation with consequent greater generation of stormwater flows should be taken into account when developing urban infrastructure, stormwater management and the potential for harvesting schemes which can contribute to water resource conservation**.**

Observation 4

A better definition of stormwater flows in urban areas and the proportion of them that can be available for access as a consumptive resource should be undertaken.

The data available for the preparation of National Water Quality Management Strategy (NWQMS) Guidelines on urban stormwater was somewhat limited, and potential users of these guidelines are required to transition across to the Drinking Water guidelines.

Further research should be undertaken into the suitability of treated urban stormwater for addition to the drinking water system (as is already undertaken in Orange, New South Wales). This research should address human health, compositional and economic issues. In addition, consideration should be given to tightening the management of overflows from wastewater treatment plants and sewers in the NWI in the light of the increased interest in stormwater recycling. It is noted that ACTEW had 275 such overflow events in Canberra in 2008-9 (NWC 2010)

Observations 5 and 6

Further research should be undertaken into the suitability of treated urban stormwater for addition to the drinking water system

There is considerable scope for the States to reform how water services are provided and how the planning is undertaken that ensures water utilities have access to, or have the ability to purchase, additional bulk water entitlements when required.

Policy Bans

There remain areas where some State/Territory governments appear to place "policy bans" for political convenience, including recycling, desalination, rural – urban trade, inter-basin transfers, cross-border transfers, new dams and privatisation, even though they are used in other parts of Australia. Figure 2 shows an example of a stormwater "policy ban" advertisement. Yet if we go to the state's planning document "Water for Good" (SA Government 2009), we find in the text the following equivocal statements:-

Recently introduced national guidelines provide uniformity for public health and environmental risk assessments for some uses of recycled stormwater, including the potential to add it to the drinking water supply… The community strongly supports the greater use of stormwater…While we will monitor future scientific developments and technological innovations, we do not intend to feed recycled stormwater directly into the mains water system. ... While it is economically viable, the health risks involved with reusing urban road run-off stormwater for drinking require further investigation.

Figure 2. Example of a "Policy Ban" advertisement. *The Advertiser*, Adelaide, July 15 2009

The adoption of indirect potable recycling (purified recycled water) for drinking is a particularly sensitive area. While accepting that the community must "own" the decision which may have been made to adopt its use and a high degree of skill and risk assessment is necessary for its successful implementation, the Academy supports the National Water Commission's view, namely

"The introduction of treated recycled water into the drinking water supply (i.e. purified recycled water (PRW)) is an important option to improve Australia's long-term water security. The Commission strongly encourages objective and even-handed consideration of PRW as one option for communities to augment their water supplies."

Observation 7

The Academy supports the National Water Commission's view that the introduction of treated recycled water into the drinking water supply (i.e. purified recycled water [PRW]) is an important option to improve Australia's long-term water security and should be considered on its merits.

Water Efficiency Gains

There are a range of options for physical and economic efficiency gains in urban water services.

Sydney Water has shown the extent of savings that can be achieved by a range of approaches, but during 2000-2005, leakage reduction achieved the most significant gains (Figure 3).

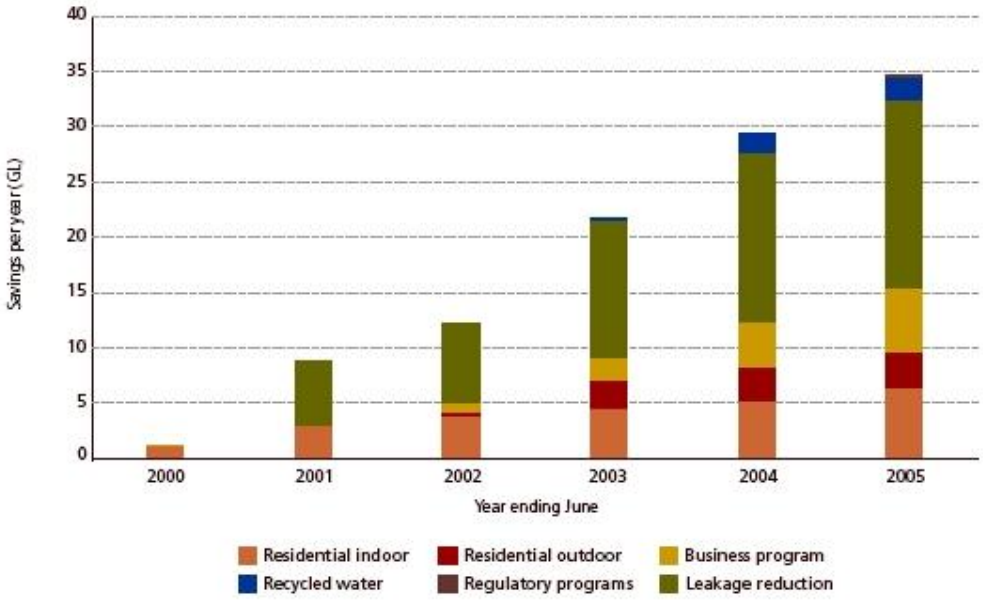

Figure 3 – Components of savings per year achieved by Sydney Water 2000-2005.

The National Water Commission Performance Assessment for 2008-9 (Figure 4) (NWC 2010) showed wide variation in the extent of leakages per connection per day, highlighting the scope for further improvement. It will be noted that while Sydney Water has continued to reduce losses, some other utilities' losses have been actually increasing. It may be noted that Sydney Water has operated under an independent pricing regulator for some years, unlike most other interstate service providers.

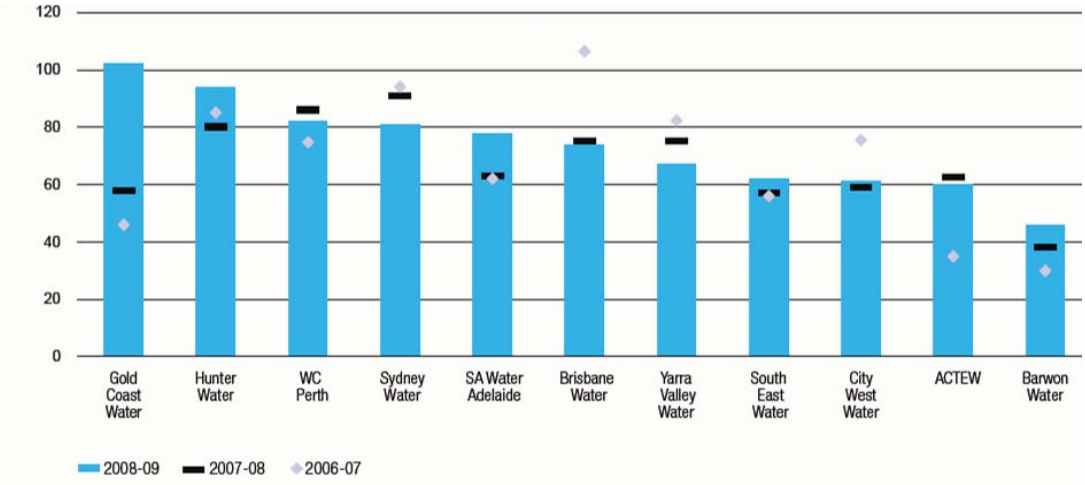

Figure 4 – Water losses, litres per connection per day, 2006-7, 2007-8 and 2008-9 (NWC 2010)

Leakage problems, in part, reflect the age of much of the cities' trunk reticulation infrastructure, which can be up to 100 years old. New techniques have become available for remediating these installations, but they involve considerable outlay. There appear to be only limited incentives for utilities to pursue efficiency issues, especially where the price of water does not necessarily relate to the cost of producing it and there is little or no competition in the industry. Rationally, utilities only repair leaks which save enough water to offset the cost. Being able to charge the true commercial cost of water will serve as an incentive to do so.

Access to water resources for urban supply

Observation 8
The community as a whole needs to be encouraged to have a better understanding of the water cycle.

Planning systems should embrace an integrated "whole of landscape" approach – rather than having discrete planning systems that separate water management, ecology, coastal processes and land use planning at local and catchment scales. Within cities, a greater awareness of water sensitive urban design should be developed. When major new capital investments are contemplated, an appropriate forum should be used to bring departments, authorities, councils, service providers and regulators together to advance integrated water management. A brief review in major towns/cities of opportunities for integrated water management, costs and benefits should lead to government or other overarching entity decisions on the way forward in each case. State governments need to commission established or new independent auditors to audit the outcomes of such decisions.

Observations 9 and 10

Planning systems should embrace an integrated "whole of landscape" approach – rather than having discrete planning systems that separate water management, ecology, coastal processes and land use planning at local and catchment scales.

Access to water resources by urban water utilities should be provided under the same principles as those for other water users – namely through ownership of entitlements as determined in the 1994 Water Reform Agenda and the 2004 National Water Initiative.

A pillar of the 1994 Water Reform Agenda was the separation of the functions of water resource management from water supply services. The Academy draws attention to the fact that this principle is now being breached in several states. A merger between Melbourne Water (a water supply wholesaler), the Port Phillip and Westernport Catchment Management Authority and the Central Coastal Board, is due to be completed in June 2011 (Melbourne Water 2010). The Queensland Bulk Water Supply Authority (QBWSA), trading as Seqwater, is a statutory authority and was created under the *South East Queensland Water (Restructuring) Act* 2007. Seqwater acts as a water wholesaler and has 25 dams, 47 weirs and 46 water treatment plants, but appears responsible for water resource management on 1.2 million hectares of catchment (Seqwater 2009).

Observation 11

Current water resource management / water supply services separation arrangements should be reviewed as to whether they have been implemented appropriately, or whether some changes in the 1994 Water Reform Agenda should be undertaken.

Interdependence of water policies with those for population, natural resource management, agricultural land use, biodiversity conservation, energy and climate change should be recognised.

For example, there is a strong relationship between establishment of new forests and catchment water flows and groundwater replenishment. It may be noted that, in the area of the South East Natural Resource Management Board, South Australia, those intending growing and managing forestry stands are being required to hold or secure a water allocation (NWI definition – entitlement) to engage in forestry (SA NRMB 2009). The water level in the Blue Lake, which is the water resource for the local urban area, Mount Gambier, has been progressively dropping, due at least in part to increased commercial forestry, exacerbated by the drought. The pumps had to be lowered recently to reach the water supply. Similarly, a pine forest planted on the Gnangara Mound, Perth's primary source of urban drinking water, is being removed to increase groundwater infiltration.

The interdependence of policies affecting urban water management are illustrated in their greatest complexity in Figure 5.

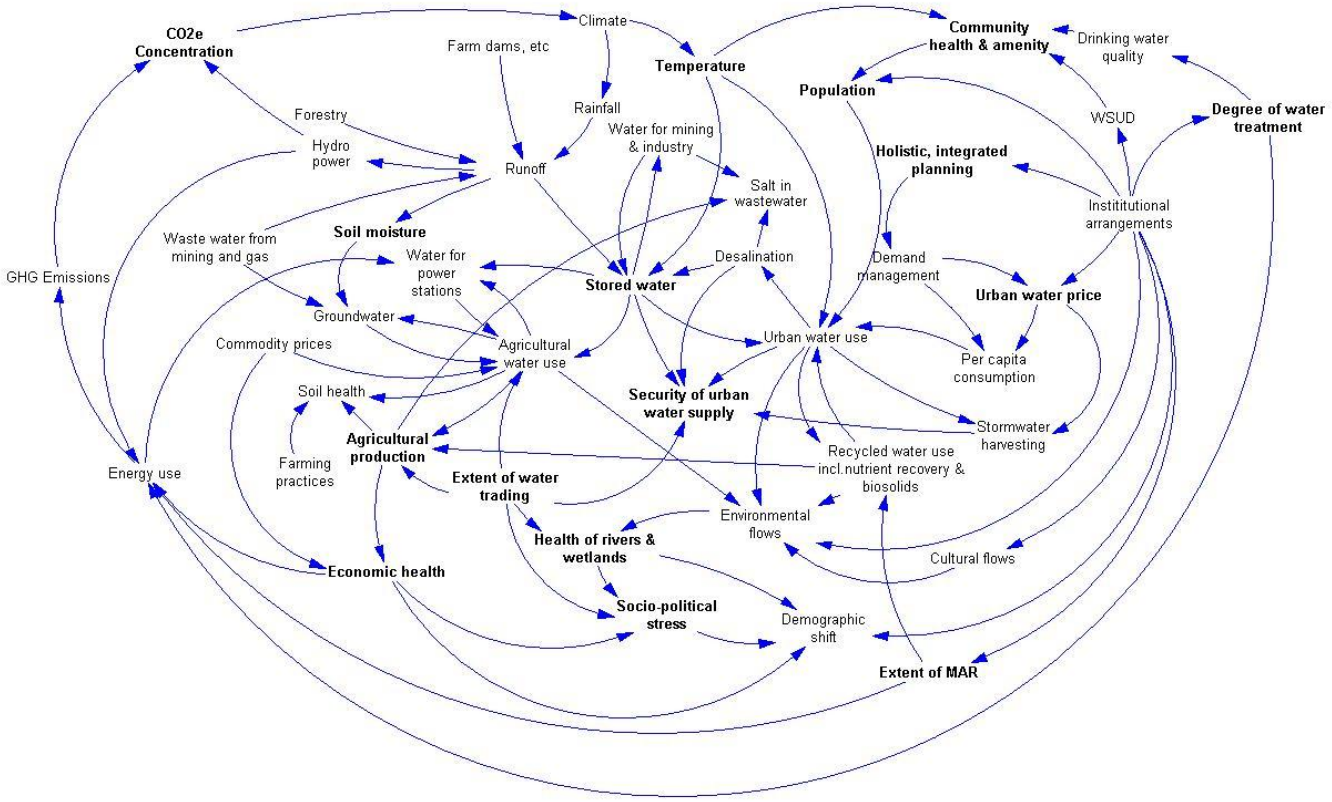

Figure 5. Interdependencies with water. Derived by Davies, Spies, Connor, Newell and Proust following the June 2010 ATSE International Water Workshop

Observation 12

Policy-makers must ensure they consider the interdependence and integration of the policies they are contemplating with those of other areas, including water. For example, projected policies relating to carbon sequestration or biodiversity through tree planting or woodland thickening should fully take into account the scientific interdependence of these policies with those of catchment management.

Water Security and definitions

It is well established that the cheapest source of additional water is often purchase from rural irrigators, an approach that has caused some angst in rural irrigation areas. It is unclear whether the Murray Darling Basin Plan will take account of the alternative economics of, for example, buying water from irrigators and pumping it to urban supply systems *vs* the cost of the urban supply system investing in desalination. Whilst recognising that the desalination plant makes the water supply climate independent, such an examination should evaluate the ability to purchase "high security" water for "basic human needs", and the scope to trade the water on the temporary market when not required.

However, there is a problem with the definitions of "high security" water as it has different meaning in different states, or is not recognised at all in some states. A consistent definition of "high security" water should be developed and adopted across the states to facilitate water trading. As a

further aspect, should there be a separate level of security recognised for “basic human needs”, and water purchased and converted to that category?

Though not a specific urban water issue, any revision of the NWI should mandate the use of NWI-compliant language in acts and regulations as defined within the NWI and agreed by governments. Currently, despite their commitments, the jurisdictions are continuing to use non-NWI-compliant language in their acts and regulations, exacerbating the complexity of trade in water products across state lines.

Observation 13
Though not a specific urban water issue, any revision of the NWI should mandate the use of NWI-compliant language in acts and regulations as defined within the NWI and agreed by governments.

Energy Costs

Energy costs may be anticipated to be increasingly important in water and wastewater operating system costs. There are significant differences in the respective component energy costs of supplying water and wastewater services in different cities. These are illustrated in Figure 6.

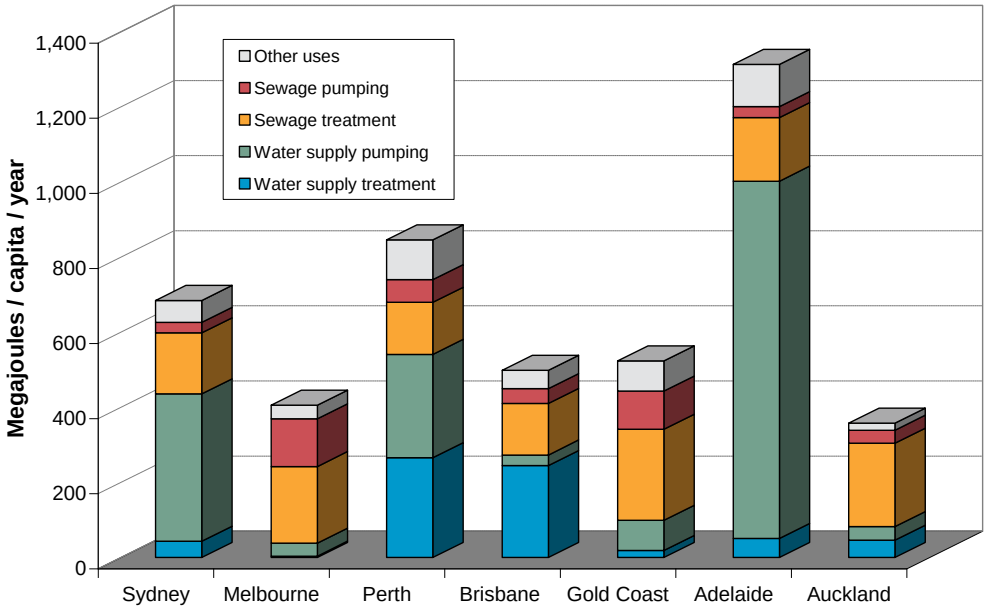

Figure 6. Energy Costs of water and wastewater services in major Australian Cities and Auckland, NZ, 2006-7 (CSIRO-WSAA)

It will be seen that sewage treatment costs in Sydney are relatively low as a significant proportion of sewage is only given primary treatment before being disposed to sea in deep ocean outfalls at North Head, Bondi and Malabar. Melbourne does not have water treatment costs as the Thomson Dam catchment is pristine. Adelaide had very high water supply pumping costs in 2006-7 due to dependence that year on taking water from the River Murray and pumping it over the Adelaide Hills – costs that would now need to be balanced against the energy costs of desalination or water

recycling. The respective energy costs of supplying these cities will now be changing with the introduction of desalination in the Gold Coast, Sydney, Melbourne, Adelaide and Perth, and potentially potable recycling in Brisbane.

The comparative energy costs of systems used for water supply have been summarised by the Queensland Water Commission (Figure 7).

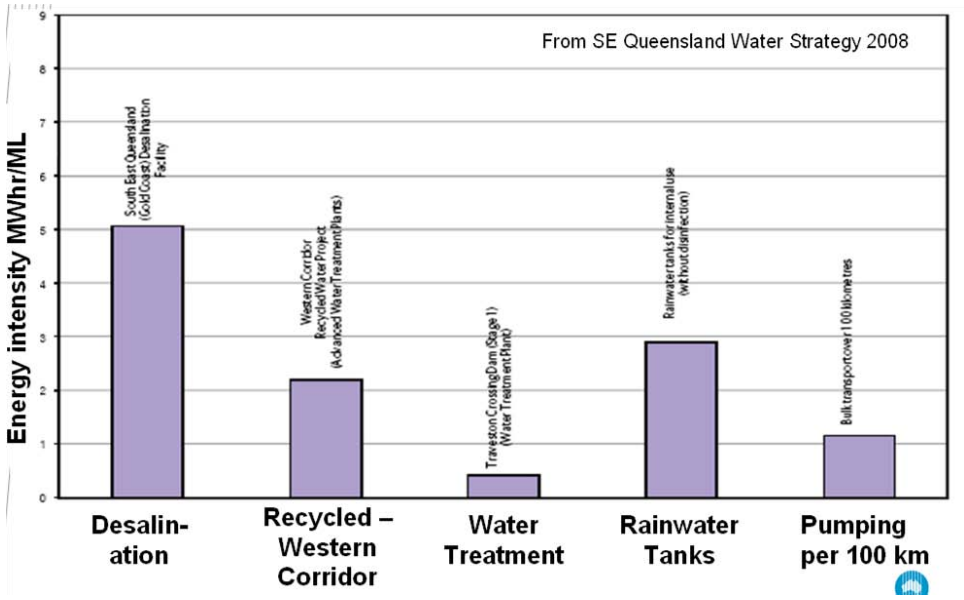

Figure 7. Estimated energy intensity of supply options (QWC 2008)

It has been estimated by Priestley (2010) that there will be increasing energy costs nationally as Australia moves towards a 25% population increase by 2030, the energy cost being a function of per capita consumption and the combination of water sources chosen (Figure 8)

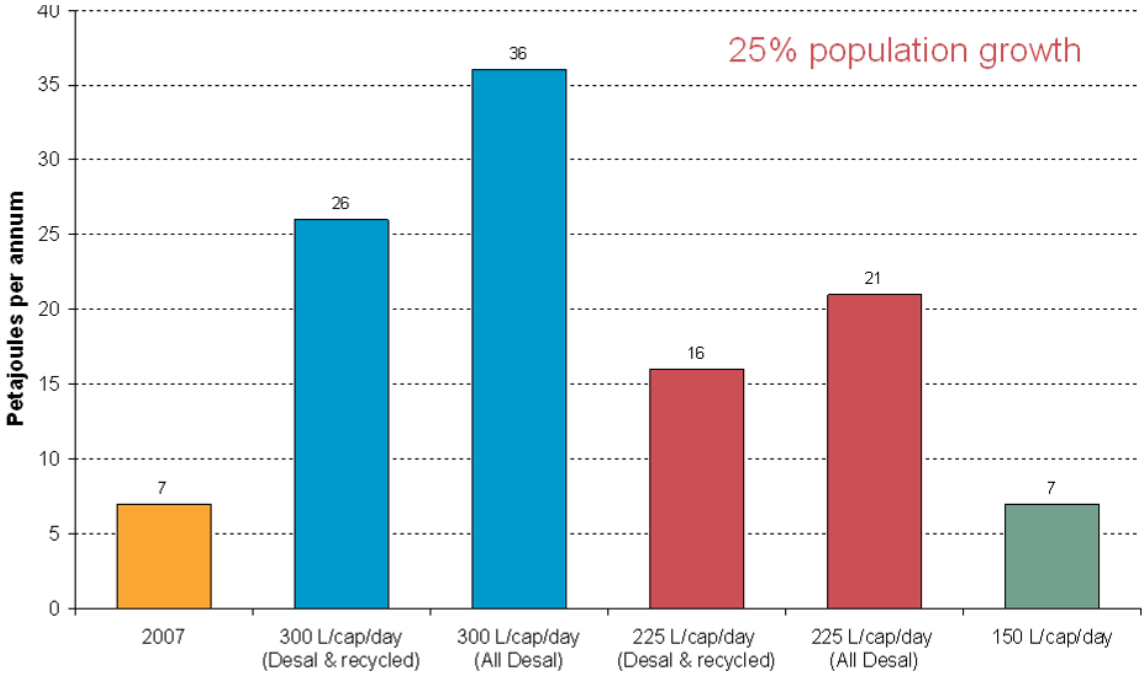

Figure 8. National energy consumption of an Australian population 25% higher than currently at 150, 225 and 300 litres consumption per person per day using alternative water sources (Priestley 2010)

However, the amount of energy attributable to households from the provision of water and wastewater services is relatively small compared with that used within households for domestic hot water services after the water has been delivered to the home. The comparative energy requirements are shown on Figure 9 (Priestley 2010).

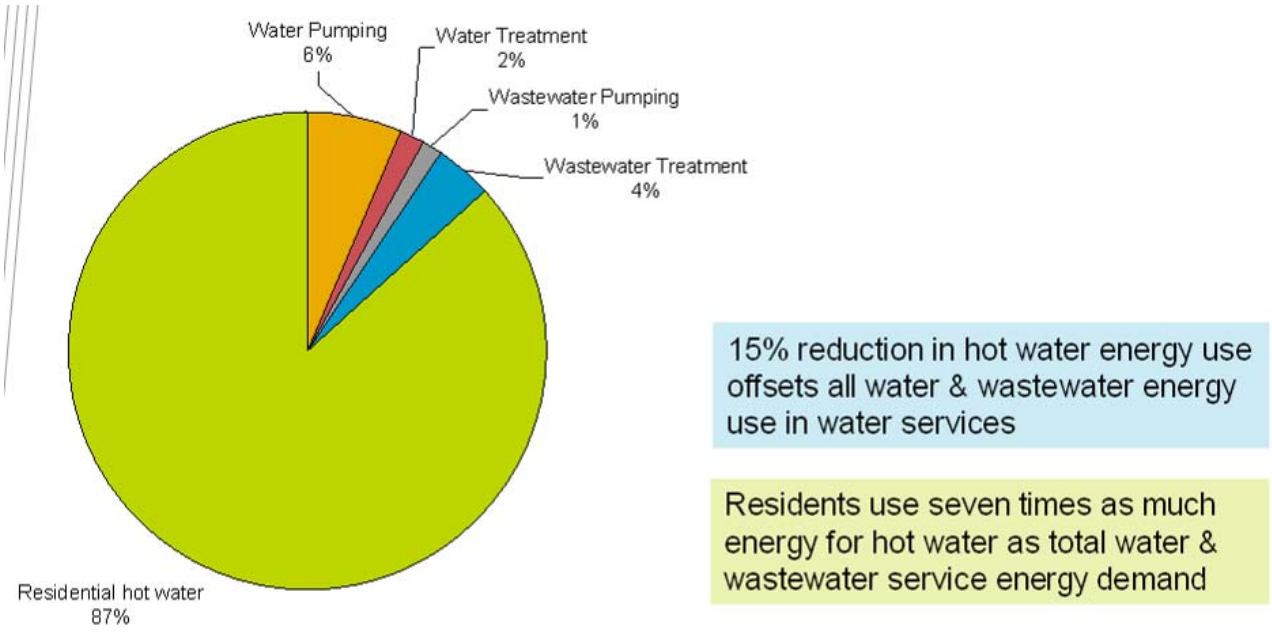

Figure 9. Energy use for the provision of water supply, water heating and wastewater services in the home (Priestley 2010)

Observation 14
Much more policy attention should be given to increasing the efficiency of domestic hot water heating.

The requirements for provision of alternative water sources will in future need to take account of the greenhouse gas production in achieving those water sources. Estimates by Leslie are given in Table 3

Table 3. Greenhouse gas production from alternative water supply sources expressed in kg CO_2 equivalent/kL of water produced (Leslie 2010)

	Desalination	Recycling	Storm water
Power	6.2	1.7	0.4
Chemicals	0.22	0.16	-
Membranes	0.12	0.09	-
Materials	0.12	0.09	0.05
Total	6.52	1.95	0.45

The impact of a price per tonne of CO_2 equivalent on the cost of water from desalination or water recycling has been estimated by Leslie (2010) as shown in Figure 10, demonstrating that desalination is potentially more sensitive to the price of carbon than is production of potable water from recycling.

Figure 10. Estimated increases in the operation and maintenance of recycled water and desalination plants with increasing carbon price (Leslie 2010).

A greater focus should be placed on pricing signals (see below) that can vary according to scarcity and demand. *Inter alia*, that would lead to a more dispassionate investigation of potable recycling. Currently, large quantities of often highly treated effluent are returned to oceans and rivers in inappropriate quantities and at the wrong locations. These costs are not necessarily taken into account in comparative cost assessments involving recycling, probably because of system rigidities and the scale of sunk costs in the existing system.

Observation 15
A greater focus should be placed on pricing signals (see below) that can vary according to scarcity and demand.

Consumption and Pricing

Most metropolitan urban water utilities have undertaken modelling to identify future trends of water demand based on anticipated population increases. Populations are growing faster in some areas of Australia (such as the Gold Coast) than other metropolitan areas.

Community attitudes can also be influenced both by restrictions *per se*, but also by imposed and accepted social norms.

Figure 11 shows the extent of distribution of water consumption per connection in 2002-3 and in the second quarter of 2008 in Brisbane, during which time average consumption per household fell as low as 112L/person/day The social change was maintained in late 2009 after the "drought" in Brisbane had been largely dispersed by rains, with consumption still much lower than in the pre-drought period (Figure 12).

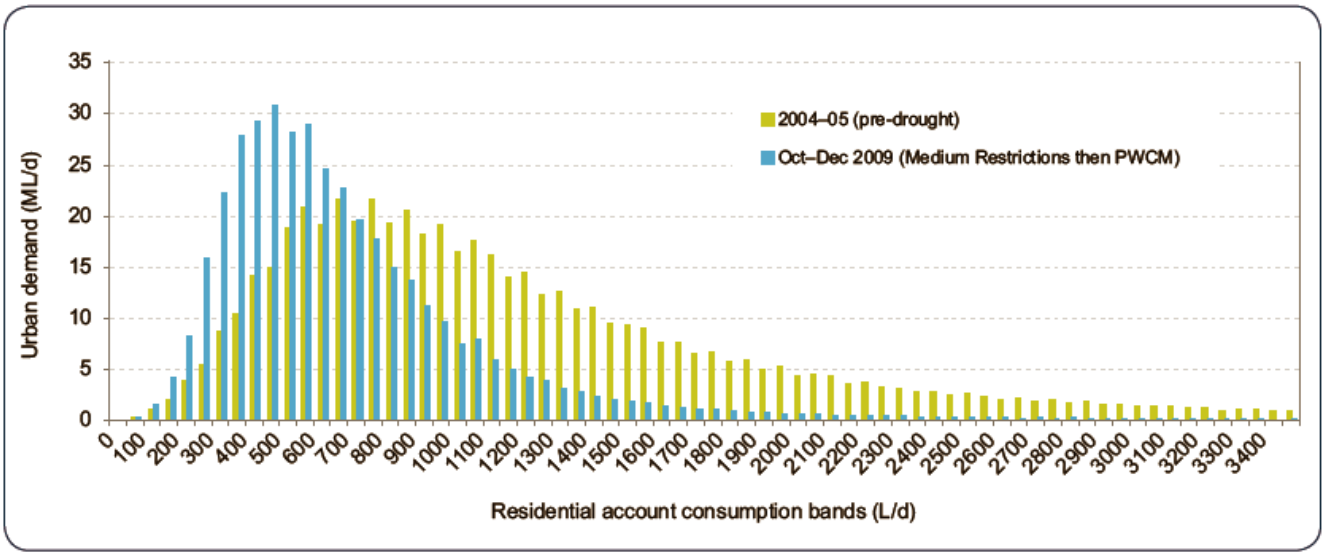

Figure 11. Distribution of Consumption, South-East Queensland, 2004-5 and fourth quarter of 2009 (QWC 2010)

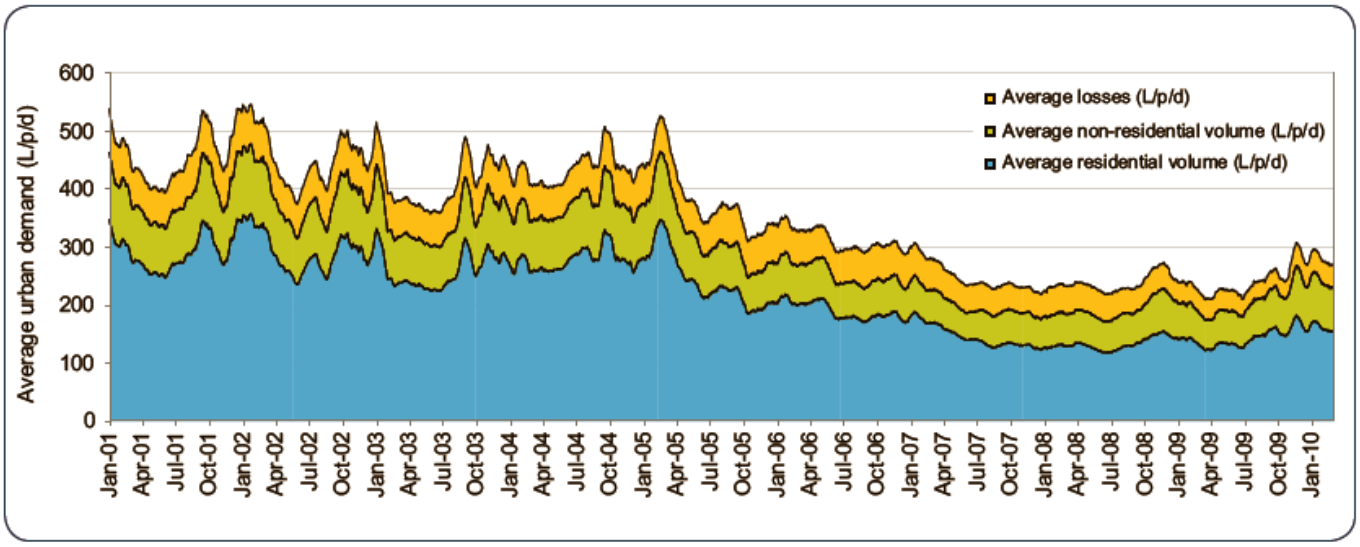

Figure 12. Total consumption per person, Central South-East Queensland and Gold Coast 2001-2010 (QWC 2010)

Pricing and Charging For Water

Governments have tended to use water pricing regimes to achieve equity, environmental, revenue and economic efficiency objectives simultaneously. Indeed, as the National Competition Policy review noted in 2002, one state was in the habit of taking dividends in excess of 100% of the after tax profit of its water utility. An all-encompassing policy approach violates a golden rule in policy development, *viz.* to avoid conflicts – use a separate instrument to achieve every objective and, once an instrument is assigned to one objective, don't try to use it to achieve another objective (Young and McColl 2007). State Governments have participated in the setting of dividends, the delivery of major projects, pricing structures for public water, desalination versus recycling and so on, all the time drawing on the argument that water is different because it plays a central role in sustaining life. A wide variety of pricing structures continues to be adopted.

Cross-subsidies are rife throughout the water sector. Wherever possible they should be identified and either eliminated or made transparent. There can be perverse results from Commonwealth infrastructure grants which are not captured in water pricing for users. It is noteworthy that NSW IPART has moved away from inclined block tariffs. As yet, economic regulators have insufficient independence to set water prices, except in New South Wales, Victoria and the ACT. "Postage stamp pricing" remains the norm. There has been no implementation of scarcity pricing. Many residents receive no price signals with regard to water use as this is still paid by landlords, and, in NSW at least, most multi-apartment complexes are not individually metered. Water bills may be sent so infrequently that any price signals are effectively disconnected from the time of use. Although water and wastewater services represented only 0.7% of average household income in a 2004 Australian Bureau of Statistics analysis, concessions to water consumers are still generally being cross-subsidised by other water consumers through the water business. Any necessary payments on social equity grounds should come from consolidated revenue-funded welfare appropriations.

However, the first signs that there is potential to change current pricing and charging models have appeared with Melbourne's biggest retailer, Yarra Valley Water, starting work on a range of water options for households and businesses, including:

- A "high security" water tariff, where customers pay a higher price for an unrestricted supply.
- A "scarcity" tariff, where customers pay a cheaper price on the grounds they will consume frugally and face supply restrictions sooner than customers on more expensive plans.
- An "environment" tariff, where customers would pay extra to ensure their water is delivered using environmentally friendly methods such as green power, or to ensure extra flows are returned to stressed rivers.
- A "community" tariff, where customers would pay extra to ensure that groups such as sporting clubs had access to water through rain tanks and other means.

The options would require approval by the Essential Services Commission (Ker 2010). How these alternatives would be implemented and monitored is as yet unclear.

Observation 16
Revisions to regulations and the NWI should be such as to facilitate the offering of a range of alternative water products.

Similarly, there has been a diverse approach to sewage charges, with little evidence of innovation and little recognition of volume treated. However, Melbourne's Yarra Valley Water has offered householders a novel approach through paying a fixed charge of $184.54 per year plus $1.3181 per kilolitre of sewage produced. It is assumed that a proportion of the water taken returns to a sewer. The assumed percentage is different for houses and flats and varies by season. In winter it is assumed that 90% of all the water passing through the meter returns to the sewer. In summer the assumed percentage is less. Avid grey water recyclers can apply for their assumed percentage to be lowered (Young and McColl 2008).

Price regulation

In the absence of any effective price competition among water supply providers, which all currently operate as monopolies, consideration should be given to the forms of price regulation. It has been noted in the National Water Commission's Second Biennial Assessment (NWC 2009) that:

> *Independent economic regulation is promoting transparency, rigour, and at least broad consistency in price review and price setting processes in Victoria, New South Wales and the ACT. While the Commission acknowledges some progress in other jurisdictions, such as South Australia's recent announcement that the role of the Essential Services Commission will be extended, South Australia, Tasmania, Western Australia and the Northern Territory do not yet benefit from fully independent economic regulation.*

Observation 17

The NWC's approach to encouraging independent price regulation in those jurisdictions not yet having it is endorsed. In the longer term, there is merit in considering a national approach to independent price regulation.

Competition in supply

The Academy is aware of only two circumstances where direct competition for provision of water services and supply currently applies. Both have had distortions in the provision of capital for their achievement.

The first is the competition at householder level between self-installed water sources (domestic water tanks, often subsidised by government grants, or domestic groundwater bores, for which generally there is no resource charge and little regulation, Perth being the most obvious example). These sources are beginning to have an impact on the operations of retail water companies. This was recently highlighted by the Managing Director of Melbourne retailer South East Water (Cox 2010) pointing out that stimulation of competition for its core product was leaving water utilities with an increasingly "stranded" monopolistic asset base.

The other known example is from the City of Salisbury, South Australia, which has been selling harvested and wetland remediated stormwater for industrial and amenity use as an alternative to reticulated Adelaide tap water from the South Australian Water Corporation, albeit with various subsidies accepted to generate the capital to do so. Subsequently, SA Water has moved into reticulating recycled water from its Bolivar WWTP to the Salisbury area and mixing it with Salisbury Council water (which has much lower salinity) for use in the "third pipe" recycled water system at Mawson Lakes. These developments, though now of some standing, are probably still in advance of the necessary legislative framework.

Only New South Wales has legislation which recognizes scope for competition in water supply with its *Water Industry Competition Act 2006.* This forms the basis of the Rosehill recycled water project, a joint venture between Veolia and Jemena Asset Management to form Aquanet Sydney, but has been dependent on the back up and supply of customers from the Sydney Water Corporation (McVean 2010). The legislation provides for a Network Operator's Licence – to construct, operate or maintain infrastructure; a Retail Supplier's Licence – to supply water or sewerage services to others, or a Combined Licence, but effectively only covers private enterprise operators as the licences are not required if a public water utility/local council owns the entire site where the infrastructure is situated.

Apart from these examples, there is virtually no real competition in urban reticulated water supplies in Australia. **Sydney, Adelaide, Perth** and **Canberra** have **v**ertically integrated Government Business Enterprises (GBEs), with Sydney, Perth and Canberra directly operating the businesses. South Australia contracted out the operation of the Adelaide component of the water system owned by the South Australian Water Corporation by competitive tender in 1995 to United Water, but has recently announced that the next service provider will be one of two other

current tenderers. Whilst this has provided a degree of competitiveness for the system owner, it does not provide any choice for the water user other than through the ballot box. **Melbourne** has one GBE bulk supplier and three GBE retailers which can be benchmarked against each other but do not compete *per se.* **South East Queensland** has two bulk supply authorities, **Seqwater** providing catchment water and **Watersecure,** providing "manufactured drinking water" from recycling and desalination. The water is distributed though a trunk delivery GBE, **Linkwater,** which operates the major water distribution pipelines in SEQ, moving water from the drinking water treatment plants and desalination plant to local distribution networks. Three local authority syndicates own retailers, *viz* **Queensland Urban Utilities**, responsible for Brisbane, the Scenic Rim, Ipswich, Somerset and the Lockyer Valley; **Allconnex,** responsible for the Gold Coast, Logan and Redlands; and **Unity Water** which will service the Sunshine Coast and Moreton Bay areas. Water purchases are from the two bulk supply authorities by the **Water Grid Manager** which is responsible for managing supply and demand in the region and issues instructions to WaterSecure, Seqwater and Linkwater about how much water to produce, release and transport. The Water Grid Manager then on-sells the water to the distribution entities. However, this system is not without a variety of distortions including that the Water Grid Manager is prohibited from purchasing water from Watersecure's Advanced Water (Recycling) Treatment Plants unless the combined capacity of the dams managed by competitor Seqwater falls below 40%. It certainly does not represent unbridled competition.

There are models in the electricity industry and that of the Australian Rail Track Corporation which offer some examples of the establishment of competition where monopoly service providers previously operated. The NSW *Water Industry Competition Act 2006* picks up aspects of such models but the "playing field is not level" in so far as GBEs are currently excluded.

Observation 18 and 19
The National Water Initiative should be amended to better provide in principle for competition options to be realised.

It is recommended that further modelling be commissioned of how water systems can be configured and owned to allow retail purchasers a choice of water supplier and/or products, and the legislative structures that may be required to achieve such an outcome.

Competitive Wastewater Treatment Services

There would also be potential to design a competitive wastewater system similar to that suggested for drinking water reticulation. As pointed out by Power (2010), discussion with the regulators and proponents has highlighted several issues, which are common to all jurisdictions and need further consideration. These include the long-term management of on-site systems, alternative disposal mechanisms, ownership of recycled water (there would need to be clarification of who had title to the wastewater, and at what point it transferred from the householder to a treatment authority), cross-connections, decreased flow to sewers, long-term security of supplies through private service suppliers, laboratory capacities within states, and validation.. There is a variety of issues here, such as scope to operate sewer mining businesses, the impact on sewer operations of

product removal from the system and future design capacity in relation to alternative uses. The adoption of recycled water ultimately depends on it being financially advantageous to do so. There are currently so many anomalies in drinking water pricing that it is difficult to get a true comparison of the costs of using drinking water vs. recycled water, which also has inconsistent costing and pricing.

Observation 20

Consideration should be given to developing a pricing environment with a complementary regulatory environment that encourages more innovative management of wastewater at the household level.

How much to Recycle?

An issue that needs to be addressed is the choice of recycling water "fit for purpose" vs. recycling all of it "suitable for drinking" purposes, irrespective of what it is used for. Currently Sydney, Melbourne and Adelaide have opted for "fit for purpose" water to be supplied in third pipe systems. This involves considerable capital cost in duplication of reticulation systems, albeit the size of the drinking water system may be able to be smaller due to reduced demand as a result of a proportion of the previous demand being met by the new "third pipe" system. Retro-fitting old suburbs is not easy and so far, dual supply systems have only been incorporated into large new housing developments.

Brisbane, on the other hand, has opted for potentially recycling a major proportion of its sewage to drinking water standards at a higher treatment plant capital and operating cost but with accessibility to the entire city and a saving in third pipe infrastructure.

Observation 21

Modelling should be commissioned to address the alternative approaches to recycling water "fit for purpose" vs recycling all of it "suitable for drinking" purposes. Regulatory environments should allow either approach to be adopted on its efficiency and economic merits.

Failed enterprises

There are few examples in Australia of failed facilities. However an example was the Aldinga Wastewater Treatment Plant which Henry Walker Environmental established in 1997 as a privately financed, built and operating WWTP and requiring 100% utilisation of the recycled water produced from the plant. Administrators were appointed to the Henry Walker Group of companies in 2005, and subsequently SA Water had to assume responsibility of the Aldinga plant.

Observation 22

Any approvals for the establishment of privately operated water or wastewater plants should include an agreed approach for continuity, possibly involving a performance bond, in the event that the original operator is unable to continue.

Water Quality and Health Standards

The National Water Quality Management Strategy guidelines for recycled water, stormwater and managed aquifer recharge have been promulgated (EPHC 2009), while the Australian Drinking Water Guidelines (NHMRC 2005) are again under detailed review. Australia's adoption of HACCP principles for water services (Cunliffe and Stevens 2003) has been widely recognised internationally and accepted by referees in subsequent water guidelines, as has the more recent adoption of DALYs (disability-adjusted life years) which is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. A recent review by Power (2010) undertook a comparison of the regulatory processes and guidelines in place for each jurisdiction. Discussions with regulators indicated similarities and differences in how they managed water standards and recycled water. This showed, for example, that the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)* was not being applied consistently. Addressing these differences and developing a nationally implemented consistent approach to recycled water regulation including water recycling should be addressed.

Observation 23

Developing a nationally implemented consistent approach to recycled water regulation including water recycling should be addressed.

The need appears to be for consistency of regulation rather than heightened regulation in this area, though perhaps all water-testing laboratories should have appropriate NATA and ISO standards to reduce the likelihood of a repetition of the 1998 Sydney Water *Cryptosporidium* event.

Observation 24

Primary responsibility for ensuring water quality and health standards should firmly rest with the water utilities themselves with an adequacy of regulation to ensure that such standards are met.

However, the water industry and regulators need to be aware of newly emerging contaminants including personal care products, pesticides, plasticisers, fire retardants and surfactants along with previously unknown contaminants arising from new industries such as the digital equipment manufacturing industries, though these are not well established in Australia. A US Geological Survey study of 139 streams in the USA in 1999-2000 found pharmaceuticals in 80% of them (Kolpin *et al.* 2002). It is notable that there are 31 million chemicals registered in the USA but only 450,000 of them are regulated. The recent review by Khan (2010) addressed the issues for

Australia and how they might be managed. Shareef *et al.* (2010) have measured pharmaceuticals, endocrine disrupting chemicals (EDCs) and personal care products in sewage and treated effluent. They found that normal secondary treatment achieved more than 95% removal of caffeine, nonylphenol, nonylphenol diethoxylate, triclosan, bisphenol A, and ibuprofen; more than 80% removal of 17β-estradiol (E2), estrone (E1), 4t-otylphenol (OP), but less than 80% removal of nonylphenol monoethoxylate (which includes production from higher chain compounds during breakdown).

Observation 25
Cognisance of the need for ensuring that underpinning water quality science is continually updated should be built into any revision of the NWI. A survey of peri-urban and urban stream and stormwater composition would form a useful basis for such developments.

Incentives for change

Both the 1994 and 2004 policy reforms now suffer from the fact that they have no statutory base and there are no sanctions or incentives that make them enforceable, though there were such mechanisms for the National Competition Council reviews and the one subsequent NWC review in 2005. As the Assessment by the NWC (2009) pointed out very clearly, implementation, even including the required new legislation in WA, has been slow. Any reforms proposed for the urban sector should take account of the potential benefits from having an applicable form of sanctions and rewards to facilitate reform.

Observation 26
It is considered that efforts should be made to secure some form of sanctions/rewards for use following the next NWC Biennial Assessment and any subsequent introduction of additional urban water reforms.

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ANNEX A

International Workshop Series

Water and Its Interdependencies in the Australian Economy

The Grace Hotel, Sydney

22-23 June 2010

EXECUTIVE SUMMARY AND RECOMMENDATIONS

The Australian Academy of Technological Sciences and Engineering (ATSE) convened an International Workshop on *Water and its Interdependencies on the Australian Economy*, in Sydney on 22-23 June 2010, with funding from the Australian Government Department of Innovation, Industry, Science and Research.

The Workshop, organised by the ATSE Water Forum Leadership Group, was attended by 50 of Australia's most senior water scientists and policy-makers. It explored the relationships between water and the other key sectors of the Australian economy, in particular energy and agriculture. Challenges included were population change, urban growth and climate change. Speakers identified sensitivity to, and projections for, water demand to the year 2050 and the importance of external drivers, interconnections, and financial investment to support sustainability of their sector.

Discussions at the Workshop drew out a number of observations likely to have important policy implications for the future of water in Australia:

1. There is a need for a refreshed national water reform agenda by 2014. Compared to the valuable national Water Reform initiative of 1994 and the 2004 National Water initiative, the new agenda should be better nested within Natural Resource Management (NRM), energy, population, and food and agriculture policies. It should also provide principles to guide the many institutions and stakeholders involved so that they work together more effectively.
2. The hugely fragmented water research efforts currently in Australia highlight the need for a national water science strategy.
3. The links between water, energy, climate change, population and agriculture are complex and solid research based on systems thinking is needed to solve the problems that arise from those relationships.
4. Rapidly evolving technologies for the supply, recycling and manufacture of water need to be embraced in a visionary national approach to ensuring a reliable, safe and affordable water supply.
5. Decision-making on major water-energy-sustainability issues requires much better cooperation between scientists and policy makers.
6. More serious consideration of indigenous cultural, spiritual and economic values is needed alongside the economic and environmental interests of the broader community in water planning and decisions.
7. Governments, institutions and communities need to do everything in their power to liberate the knowledge, skills and individual leadership of all stakeholders to reflect a more collaborative, decentralised and localised water world.

In addition to these broad strategies, some specific issues were highlighted:

- the need to understand the potential imminence and impacts of the world reaching "peak phosphorus[2]";
- the urgent need for nutrient recovery from wastewater;
- the need to reduce energy in domestic hot water systems, given that heating water in homes consumes four times as much electricity as that used to supply drinking water and sewerage services;
- the need for approaches on Australian issues of water, energy and other sectors to embrace "systems thinking";
- improvements in current community participation processes, which currently leave much to be desired; and
- the benefits that would flow from a re-think and new directions on water management, noting the vital requirement for community trust.

The meeting noted that an integrated "whole of landscape" approach should be embraced – rather than using planning methods that separated water management, ecology, coastal processes and urban planning at local and catchment scales.

Participants prepared influence diagrams illustrating the interconnections between key variables linking water and other parts of the Australia economy.

ATSE will utilise the workshop findings in its new research project *Green Growth in Australia – examining the linkages within – and potential of – sustainable resource management to enable environmentally responsible economic growth.*

[2] Phosphorus, a key component of fertilisers, is crucial for the world's food supplies. Observers note that as reserves of phosphate begin to run out, the impacts are likely be immense – in terms of difficulties in maintain food production, rising food prices, growing food insecurity and widening inequalities between rich and poor countries.

ANNEX B

URBAN WATER – Review of Water Supply Planning for Australia's Non-metropolitan Urban Water Utilities

2007

Executive Summary

Maintaining a reliable urban water supply to more than six million residents outside of Australia's capital cities is important for the ongoing success and livelihood of those communities. They contribute significantly to the Australian economy and social fabric of the nation by supporting tourism, agriculture and mining industries, amongst others.

This report provides a snapshot of the status of long-term urban water supply planning being undertaken by Australia's non-metropolitan urban water utilities. This report is based on a project conducted by the Academy of Technological Sciences and Engineering and is funded by the Australian Research Council.

This review has emerged from concerns about the ability of water utilities in some regional urban centres to undertake adequate planning in the context of highly variable and changing supply and demand conditions. The current ongoing drought across most of the country has highlighted the vulnerability of many supply systems to unforeseen climate conditions, with Bendigo, Ballarat, Goulburn and Toowoomba being notable, but not isolated examples. Technically sound water supply planning should cater for the high variability of Australia's climate and runoff.

There are certain elements within a water supply plan that one would expect to be evident if water supply planning is being adequately undertaken. These include consideration of population growth, climate variability, climate change and land use change, all of which have a major influence on future water supply availability and demand. This study postulates that there are two enabling steps that are necessary to create an environment in which prudent water supply planning will follow, namely:

- *Institutional support* – regulatory drivers, guidance, tools and datasets are available at a state, territory or national level for use by utilities in water supply planning; and
- *Technical rigour* – knowledge of the essential technical components of urban water supply planning.

This report reviews long-term urban water supply planning in each state and territory against these two elements. The degree of institutional support was assessed against available State policies, regulations, legislation and guidelines, whilst the degree of technical rigour was assessed with reference to an example plan sourced from each state or territory.

In some parts of Australia significant aspects of one or both of these two elements of institutional support and technical rigour for water supply planning were largely absent. This situation must be remedied if urban water supplies are to be adequately maintained in the face of uncertainties about future water availability and demand.

In states with local water utilities, financial incentives (subsidies) for completion of water supply plans in New South Wales and Queensland were less effective in ensuring completion of plans in accordance with state guidelines than regulation in Victoria. Only 29% of water utilities in New South Wales had commenced their long-term water supply plan by July 2005, which was more than two years after an example plan was made available by the State Government.

An example long-term urban water supply plan in areas outside of capital cities could be readily located in every state or territory except Tasmania, where no formal plan was able to be located. The Tasmanian Government called for tenders for a long-term water supply plan for the town of Bicheno in early 2007, indicating that an example plan is likely to be available in late 2007. In those states or territories where a good support framework had been established for water supply planners, evidence of at least one high quality non-metropolitan urban water supply plan was found.

Most states and territories have a policy, regulatory or legislative framework for managing water resource availability from an individual resource, but there is lack of consideration of how urban water utilities fit into this framework. Assigning resources from a single source for water resource planning, which has been a prime focus of the National Water Initiative, is a separate decision making process from selecting resources from a variety of sources for urban water supply planning. This distinction is not

universally acknowledged across Australia and there is no formal requirement for urban water utilities in South Australia, Tasmania, Western Australia and the Northern Territory to undertake long-term urban water supply planning. Current projects to review and reform aspects of water management and regulation in Western Australia and Tasmania present an opportunity to create a regulatory driver in these states. Ideally, water supply planning should also be linked with energy and land use planning decisions in an integrated manner.

Recommendation 1: Consideration should be given to providing greater regulatory drivers for water supply planning for urban water utilities in all states and territories, with the exception of Victoria, where a sound policy framework for urban water supply planning already exists. This will improve the quality, extent and transparency of urban water supply planning in these states and territories. Greater regulatory drivers should replace project subsidies in New South Wales and Queensland and be coupled with other appropriate project funding arrangements.

The extent and quality of water supply planning by local water utilities in Queensland is currently unknown by the Queensland Government, which is a significant information gap when assessing the adequacy of current planning activities.

Recommendation 2: Consideration should be given to monitoring the progress of water supply planning by local water utilities in Queensland as part of its existing annual water utility benchmarking report, similar to that which occurs in New South Wales.

The Tasmanian Government set up a taskforce in late 2006 to reform its water and sewerage sector, which ATSE believes should strongly consider establishing regulatory drivers for long-term urban water supply planning in that state. The absence of evidence of systematic urban water supply planning in Tasmania highlights the urgent need for urban water reform in that state.

Recommendation 3: Consideration should be given to establishing an urban water supply management and planning unit in the Tasmanian Government to guide and regulate local water utilities, similar to the role currently played by government agencies in Victoria (Department of Sustainability and Environment (DSE)), New South Wales (Department of Energy, Utilities and Sustainability (DEUS)) and Queensland (Queensland Water Commission (QWC) / Department of Natural Resources and Water (DNRW)) that have local water utilities.

There are a variety of institutional models for non-metropolitan urban water supply management at a state and territory-wide level, ranging from a single utility across most of a state or territory to a multitude (100+) of local council owned water utilities. The institutional model adopted is considered to have a direct impact on the extent and quality of urban water supply planning undertaken in each state and territory. A comparison of progress against state urban water supply planning guidelines in Victoria and New South Wales, and within New South Wales itself, highlights that smaller utilities are slower to commence their urban water supply planning despite the availability of State Government support.

Managing and planning water supplies is becoming increasingly more complex with more complicated water treatment technologies and a greater diversity of water sources. It is questionable whether institutional models of the past are adequate in the light of this increasing technical complexity that requires the ability to recognise the need for and effectively use highly specialised skills.

Recommendation 4: A study should be undertaken of the efficacy of the non-metropolitan urban water utility institutional models in the various state and territories to determine which models are most appropriate to adopt, as current arrangements are not uniformly producing desirable water supply planning (and potentially many other) outcomes, particularly for utilities managed by local councils.

States and territories typically do not give adequate consideration to uncertainty in their water supply planning. Most notably there was no quantification of the effect of climate change in water supply planning in Queensland, New South Wales, Tasmania and the Northern Territory. Given recent climate conditions and global warming trends, this oversight is of concern. Determining climate change impacts on runoff at a statewide level can significantly reduce the technical burden on water utilities, encourage scenario planning for a range of climate change conditions and promote consistency of information in broader planning forums, as seen in Victoria.

Triple bottom line (social, financial/economic and environmental) assessments of demand reduction and supply enhancement options were not evident in example water supply plans for Victoria, the Northern Territory, Queensland, Western Australia and Tasmania. This indicates that many water supply planning decisions are still being made without taking into account net social and environmental benefits and rely solely on financial cost comparisons. Triple bottom line assessment frameworks are known to exist in most states and territories.

All state and territory resource managers are yet to complete the setting of the size of the consumptive pool, which hampers the ability of water supply utilities to invest in new water infrastructure with certainty. Most states and territories are nearing completion of this task.

All states and territories lack information on the effect of climate change on groundwater yield and the effect of land use change on groundwater and surface water yields. The expansion of plantation forestry and the prevalence of bushfires in recent years in particular will have significant but currently largely unknown impacts on future urban water supplies. This technical issue has been addressed in some states by site specific studies, but no state or territory resource managers have yet provided uniform advice to water supply utilities on the nature and magnitude of this impact in all of their water supply areas.

Recommendation 5: The shortcomings identified in this review in the area of climate change, vegetation change and the setting of the size of consumptive pools should be immediately addressed and incorporated into future long-term urban water supply planning. This recommendation supports actions identified under the National Water Initiative that are currently being implemented by states and territories.

The above conclusions and recommendations are drawn from this overview of urban water supply planning in Australia. Further investigations and analysis are recommended to ascertain the extent to which sound urban water supply planning is being undertaken in all regional areas, rather than just the examination of readily available example plans.

Recommendation 6: Following on from this review, consideration should be given to undertaking a complete investigation of non-metropolitan urban water supply planning to gain a full picture of the extent to which individual utilities are undertaking long-term urban water supply planning and implementing the actions from those plans.

Almost all urban water utilities and state and territory agencies approached for this study shared information freely and responded to requests in a timely manner. This highlights the willingness of Australia's water supply managers and planners to participate in water industry reform despite the pressures of day to day water supply system management. There will nevertheless be a lag between instituting the above recommendations at a state and territory level, having them taken up by water utilities in their water supply planning and then implementing the actions identified in those plans. This lag means that urgent action is required in order to better prepare the nation's non-metropolitan urban water utilities to adequately balance supply and demand in the near future.

ANNEX C

ABBREVIATIONS

ATSE	Australian Academy of Technological Sciences and Engineering
CO_2	carbon dioxide
COAG	Council of Australian Governments
DALYs	disability-adjusted life years
EDCs	Endocrine Disrupting Chemicals
GBEs	government business enterprises
HACCP	Hazard Analysis Critical Control Point
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
NRMMC	Natural Resource Management Ministerial Council
NRMSC	Natural Resource Management Standing Committee
NSW	New South Wales
NWI	National Water Initiative
NWQMS	National Water Quality Management Strategy
PIMC	Primary Industries Ministerial Council
PISC	Primary Industries Standing Committee
PRW	purified recycled water
WWTP	Waste Water Treatment Plant