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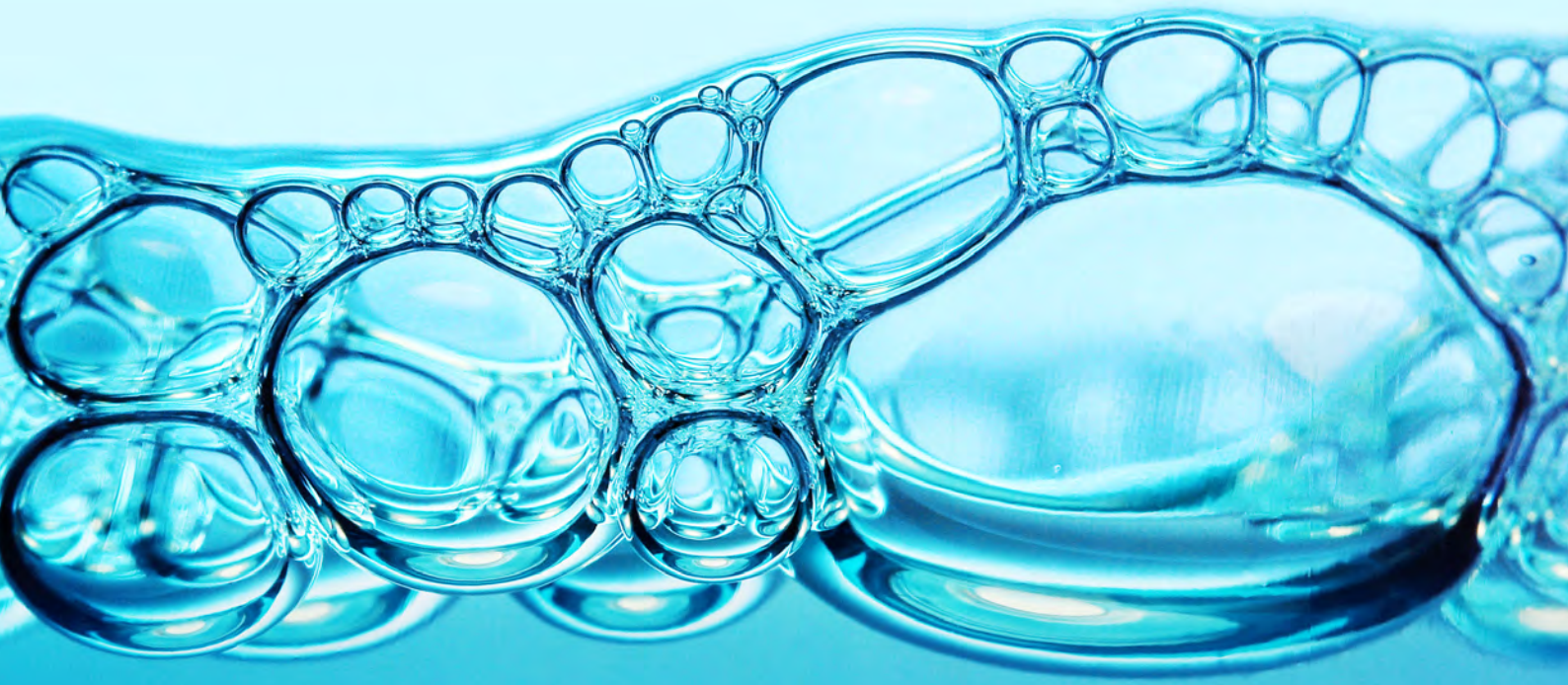

Review of Regional Water Quality & Security

Review & Reform Strategy

Volume 1

Prepared for Infrastructure Australia

Enhancing and sustaining the world's built, natural and social environments.

Review of Regional Water Quality and Security

Volume 1 - Review and Reform Strategy

Prepared for

Infrastructure Australia

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Abbreviations

ADWG	Australian Drinking Water Guidelines
AWA	Australian Water Association
COAG	Council of Australian Governments
DECCW	NSW Department of Climate Change and Water
DEEWR	Commonwealth Department of Education, Employment and Workplace Relations
DERM	Queensland Department of Environment and Resource Management
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts
DWE	NSW Department of Water and Energy (Now DECCW)
ESC	Essential Services Commission (Victoria)
GSA	Government Skills Australia
HACCP	Hazard Analysis and Critical Control Points
IPART	Independent Pricing and Regulation Tribunal
kL	Kilolitre (= 1000 L)
KPI	Key Performance Indicators
L	Litre
LGAT	Local Government Association of Tasmania
LGSA	NSW Local Government and Shires Association
LWU	Local Water Utility
mm	Millimetres
NATA	National Association of testing Authorities
NHMRC	National Health and Medical Research Council
NRMMC	National Resource Management Ministerial Council
NPP	National Partnership Payment
NPR	National Performance Report
NWC	National Water Commission
NWI	National Water Initiative
PWC	PricewaterhouseCoopers
QCA	Queensland Competition Authority
RWC	Regional Water Corporations
SCADA	Supervisory Control and Data Acquisition
SEQ	South East Queensland
THM	Trihalomethane
UV	Ultraviolet
WIOA	Water Industry Operators Association
WIST	Water Industry Skills Taskforce
WSAA	Water Services Association of Australia

Executive Summary

The performance of urban water utilities in Australia's capital cities and larger regional centres is now well understood, thanks to the nationally consistent performance monitoring framework implemented by the National Water Commission and the Water Services Association of Australia in 2007. Every utility in Australia supplying more than 50,000 connected properties now reports on a range of performance indicators, measuring everything from CO_2 emissions to the number of complaints made by their customers. Indeed, as a recent review of Urban Water Security Strategies in Australia demonstrates, the analysis and performance reporting for Australia's major water utilities is comprehensive.

However, the same cannot be said for smaller water utilities, where performance reporting is patchy and inconsistent. Consequently, it is virtually impossible to present a national picture of water quality and water security outcomes for those living in Australia's smaller regional towns. Notwithstanding inadequate available data, the evidence that is available demonstrates a definite need for action. A recent inquiry into the sustainability of non-metropolitan urban water utilities in New South Wales uncovered some worrying trends; 17 of the 106 utilities failed to comply with Australia's water quality standards, while only half of the very small utilities had water conservation and demand management plans in place.

Although the situation in other States has not been documented to the same extent, the restructuring of regional urban water utilities in Queensland and Tasmania over the last five years suggests that there was a strong case for reform. In Victoria, evidence that the small water utilities in that State were unable to consistently supply high quality drinking water was a key driver for sweeping water reform in the latter half of the 1990s.

It is against this background that Infrastructure Australia initiated this review of water quality and water security for Australia's smaller communities, which is focused on those utilities that serve towns with populations of between 2,000 and 15,000 residents.

It is important to recognise that these utilities are currently operating under increasing external pressures. For many, prolonged drought has been the norm rather than the exception and populations have declined over the past 20 years.

Regardless of the resources available to a utility, there is little that can be done to prevent prolonged drought and declining population. Therefore, this review focused on the systemic and institutional constraints that are seen as barriers to supplying high quality drinking water and achieving supply security.

The review explored a number of strategic policy solutions that could be implemented to remove the inherent barriers to achieving the desired level of water quality and water security, and suggests a number of options for reform. Finally, a range of implementation pathways are outlined.

Key Findings

a) While less than full cost recovery by some water utilities contributes to the inability to deliver safe and secure water supplies in regional communities, it is only part of the problem.

Less than full cost recovery is a common feature of water utilities servicing regional areas. However, even those utilities that earn sufficient revenue to allow a dividend payment to State Government shareholders sometimes fail to supply high quality water with acceptable security.

This suggests that under the current governance arrangements there are insufficient incentives for water utilities to meet their minimum water quality and water security service standards. It also implies that basing future changes to governance arrangements on the generation of economic resources is unlikely to be effective in isolation. Potential governance reforms to this sector should require utilities to meet performance standards, include mechanisms that transparently verify utility performance, and provide training to build knowledge and enable change.

b) Pricing water in order to recover the full cost of supply is currently difficult to achieve in many regional towns.

There is high variability in the price paid for water across regional communities. This is a result of many factors, including costs, but also pricing policies. On the cost side, the size and density of the water supply network, the capital cost for infrastructure in smaller towns and the per capita volume of water consumed are key factors. The relative expense of supplying water infrastructure to small towns often means that capital projects are unviable for

the water utility. For example, many small towns are without water treatment because the increase in residential bills to recover the cost would be substantial.

Pricing is a difficult issue, particularly because of community and local government sensitivity to price increases. However, many utilities servicing regional towns are not recouping the costs of supplying water, let alone providing for capital improvements. Many are charging prices significantly lower than in major urban areas, where economies of scale would be likely to mean lower cost. Without pricing reform, at least to cost reflective levels, many regional water utilities – even the larger ones – will remain unsustainable and water quality and security will suffer as a result.

Cross-subsidisation is a principle that needs to be acknowledged in the pricing discussion. Some utilities that service a larger geographic area spread the cost of water supply amongst all consumers – a solution not always supported by the larger regional or metropolitan communities that ultimately pay more for water to ensure neighbouring towns are serviced by safe and secure water supplies. Cross subsidisation using 'postage stamp pricing' is a principle that is applied in virtually all major urban water utilities as one of the costs that comes with the benefits of economic scale. Many regional communities benefit significantly from the application of this principle to the provision of mail and telephone services. Australians have broadly accepted the application of this principle in the water sector and this position needs to be recognised when sections of the community argue that they may be disadvantaged by this approach.

c) Water utilities servicing regional communities struggle to implement and comply with the Australian Drinking Water Guidelines – this is particularly so for smaller water utilities.

This is due to:

- Comparatively fewer human and financial resources, which is being exacerbated by declining population
- Relatively lower availability of technical knowledge and expertise
- Strong competition for skilled employees in regional areas
- Inadequate infrastructure to treat water and preserve water quality
- Poor processes for operation and maintenance of existing treatment infrastructure
- Lack of reporting and insufficient institutional incentive for utilities to comply with guidelines and licence requirements

Some regional communities are consequently exposed to a greater risk of illness from pathogens, algal toxins and other physical and chemical contaminants. Sections of the community with weakened immune systems are particularly at risk.

Although there have been no recorded deaths directly attributed to contaminated potable water in regional Australia, numerous 'boil water' notices and severe outbreaks of water quality related illness have been recorded in regional Australia.

d) A key reason for non-compliance is the absence of the necessary skills, experience and knowledge in water in many regional communities.

Both water supply managers and operators have a critical role in achieving Australian Drinking Water Guidelines compliance. Without adequate knowledge, skills and training in regional areas at the managerial and operations levels, there is a poor understanding of the scope of the Australian Drinking Water Guidelines, how they should be implemented, and why implementation is important. The potential consequences of compliance breaches are not fully appreciated and the role of the operator in actively managing water quality is poorly understood. This leads to inadequate operation, maintenance and documentation practices that contribute to poor water quality.

Treatment plant operators working in regional areas do not receive access to the same level of training provided in the larger metropolitan areas. This is significant due to the link between the knowledge and experience of operation and maintenance staff and the safety of drinking water delivered to consumers.

The Commonwealth Government has acknowledged the significance of Australia's water skills shortage following a national audit of labour and skills in the industry in 2008. Consequently, the Council of Australian Governments (COAG) committed to a National Water Skills Strategy, which aims to improve retention and training, particularly in regional and remote Australia. The Commonwealth Government has agreed to provide up to $1.1 million in support of the Strategy, however, the program is likely to be ineffective without the institutional reform required to create organisations with the scale to ensure application and maintenance of those skills.

e) Improving training and wider compliance with Australian Drinking Water Guidelines could deliver significant benefits.

Better skilled operators will be more capable of facilitating and enhancing compliance with Australian Drinking Water Guidelines. Improved compliance with the Guidelines will increase the quality of water supplied to the consumer and generate a range of socio-economic benefits.

Reducing water-related illness in the community will increase workforce productivity due to fewer sick days. Fewer outbreaks of illness will also contribute to lowering healthcare costs. Ad hoc and reactionary planning and funding will decrease, resulting in significant cost savings.

Improved training will also help raise the status and recognition of water system operators. Recruitment and retention of skilled staff in regional areas are also likely to be facilitated as water operations becomes an identifiable career path.

f) Achieving water security in regional areas is a relatively more complex task than in major urban areas because, unlike in Australia's cities, towns in regional Australia often share the same water source and this resource may be utilised by a number of water utilities.

Regional communities often share water resources with large water consumers such as irrigators, whereas most metropolitan utilities enjoy comparatively less competition for supply. Regional communities also usually share the main water source with other towns.

Sharing the same resource means that decisions made by regional utilities involve far reaching impacts, across the catchment and water system as a whole. Delivering certainty of supply, and hence water security, across a catchment therefore requires a high degree of coordination between all water users; currently this does not happen consistently. Where multiple users operate within a catchment, urban reuse schemes can have unintended consequences, with negative outcomes for downstream customers and environmental flows, as treated effluent is no longer returned to the river.

For the majority of regional water utilities their options for diversifying raw water supply sources are limited by their geographic location. The majority of regional utilities are rainfall dependent and operate within regulated systems, governed by complex water sharing arrangements. Inland utilities cannot feasibly rely on desalination of sea water as a diversification option, while treatment of brackish groundwater results in difficult brine disposal issues. Establishing physical linkages between discrete supply systems is often not feasible due to remoteness.

The Commonwealth has recognised these challenges and in response committed $254.8 million under the National Water Security Plan for Cities and Towns to fund projects that save water and reduce water losses in locations with population less than 50,000. A further $200 million has been committed under the Strengthening Basin Communities Program, which will assist communities in the Murray-Darling Basin to understand and adapt to a future with less water

g) Many planning and regulatory frameworks for the water sector are focussed at a catchment level, which typically is not the case for water utility planning, particularly in NSW and QLD.

It has long been recognised that the management of Australia's water resources according to institutional boundaries (such as State borders) has been a key barrier to achieving sustainable outcomes. Indeed, the Murray Darling Basin Plan is designed to remove this impediment.

The fact that urban water planning in parts of regional Australia continues to be defined by local government boundaries stands out as an oddity in Australia's water resource management framework. It contrasts with the approach in NSW, for example, where catchment-based water sharing plans provide a rational approach to sharing the water resource between users and the environment and, for users, between town supply, rural domestic supply, stock watering, industry and irrigation. This approach indicates that more sustainable models can be implemented.

The consequences from this regulatory framework are best illustrated through the example of water restriction regimes. The definition and application of water restrictions is governed by the water utility and is therefore applied on a supply system basis. This means that water restriction definitions and triggers are often not applied consistently within a catchment, though the water is being abstracted from the same resource.

In NSW, the regulator reserves the right to overrule water restriction decisions made by water utilities to protect the overall security of the water resource. This is irrespective of the plans that utilities have developed to inform such decisions. Thus the actions of these small utilities in delivering water security are often rendered ineffective.

h) Significant benefits could be achieved by aligning water business reporting, planning and management across regional Australia.

Water business related planning is not performed well in regional areas compared with the planning undertaken for metropolitan utilities and larger regional centres. Planning practices also differ between States, and as a result, the management of factors such as drought, demand, water quality, climate change and capital infrastructure is not achieved in a consistent manner and more importantly, not performed adequately in some parts of the country.

A direct outcome of this is that performance reports and forward planning documents are structured differently and different statistical performance measures are used. Consequently, it is very difficult to compare the effectiveness of water utilities across the nation, to develop an accurate picture of the current situation or to assess preparedness for the future.

A standard national approach would streamline performance statistics and assist governments in evaluating the need for supplemental funding. It would foster competition between the utilities which should generate more rapid progress towards the objectives of the National Water Initiative. Regulation and monitoring will be a simpler and more efficient process.

i) If water governance arrangements for water utilities in NSW and Queensland were on a catchment basis, as is the case in Victoria, significant benefits could be achieved.

Under a model similar to that in Victoria, water quality and security planning could be implemented more efficiently and, as noted in g) above, would be consistent with existing catchment based resource management plans. These outcomes would be achieved because:

- Larger, regionally significant utilities would be more likely to attract highly skilled water staff, financial and asset management planners
- A relatively larger customer base allows utilities to fund capital works with a relatively smaller impact on residential water bills, addressing a key equity concern with full cost recovery by small water utilities
- Utilities would be large enough to justify oversight by existing independent pricing regulators, delivering transparency in decision making and greater economic efficiency

Action is required now to address the institutional barriers to smaller water utilities delivering healthy water quality and water security, as the costs of inaction will only continue to grow.

Key Recommendations

As our key findings suggest, this review found that in terms of water quality, there is an Australia-wide need for improvement, while the institutional barriers to delivering water security are largely confined to NSW and Queensland. The key recommendations are summarised below.

1) Mandate compliance with Australian Drinking Water Guidelines through legislation or regulation

Under existing legislation or regulatory instruments such as operating licenses, many urban water utilities in Australia are not required to comply with the Australian Drinking Water Guidelines beyond particular water quality targets. Where compliance mechanisms do exist, the procedures for investigating and penalising non-compliance often do not provide sufficient incentive for utilities to meet their objectives.

Mandating compliance will provide utilities with a clear motivation to observe and fulfil their requirements. Each State should therefore amend the relevant legislative or regulatory framework to require mandatory compliance. This recommendation may require some flexibility in how the various elements of the Australian Drinking Water Guidelines and water quality parameters are regulated to ensure the regulation is effective and targets the risks within each water supply.

Additionally, in communities where full compliance is not practicable, regulatory exceptions would be available, with the agreed service level communicated to consumers so that they can make educated decisions regarding protection of their own health.

All regulation and legislation should include State Health departments as the health-based regulatory body responsible for monitoring, testing and reporting on drinking water quality.

Independent regulatory authorities would be responsible for non-health based audit and reporting to ensure independent review is performed (e.g. IPART in NSW). All utilities would be required to publically report on drinking water quality and audit results, which should also be published on their own websites. Appropriate

responses to various levels of non-compliance should also be implemented, with priority placed on health related non-conformances.

To assist utilities in complying with the full Australian Drinking Water Guidelines requirements, a sufficiently robust self-assessment tool and audit instrument should be identified and adopted as an industry wide standard.

2) Implement a nationally consistent Best Practice Management Framework for all urban water utilities

All water authorities supplying water to urban consumers (regional and metropolitan) should be required to report to the National Water Commission and the Water Services Association of Australia on performance, with the results to be published annually in the National Performance Report.

By streamlining performance monitoring information, a nationally consistent Best Practice Management Framework for urban water utilities could be facilitated. This framework would be the key instrument through which national urban water reform would be enabled.

The Framework development process would require a stocktake of current management frameworks both in Australia and internationally, and would take into account existing agreements such as the COAG National Urban Water Planning Principles and the NWI Pricing Principles. The National Performance Report KPIs would be updated to align with the intentions of the Best Practice Management Framework. The framework could include the following components:

- Planning processes and assumptions for Integrated Water Management
- Water security planning and water restriction definitions
- Climate change planning
- Drought management
- Demand management
- Emergency response
- Forward planning to allow measurement of forward looking metrics
- Asset management
- Pricing principles
- Consistent reporting requirements for input into the National Performance Reports

Self-assessment and independent review of compliance should also be enabled, with appropriate responses to non-conformance implemented. This would require construction of a self-assessment and audit tool following public availability of the Framework.

3) Improved Water Pricing

Significantly more work is required to ensure utilities servicing regional communities are operating commercially. Such reform needs to acknowledge equity and political issues that may arise as a result of changes to water prices, but these issues do not preclude such reform from proceeding.

Further investigation into the structures available to achieve more cost reflective pricing water pricing in regional towns should be undertaken. This investigation should take into account both utilities servicing localised areas, as well as larger regionally based utilities servicing a range of communities. State and Territory governments should play a key role this activity, in collaboration with the National Water Commission.

There are policy implications in attempting to target both efficiency and equity objectives through the price mechanism. A suggested route is that the price of water should be set to reflect costs of supply, and adverse impacts on vulnerable consumers be addressed through compensating payments made via the welfare system. One approach could be for such a payment to cover the fixed access charge of a typical residential bill while still exposing all water users to the variable element of the bill that reflects the actual amount of water used.

4) Develop a more highly skilled workforce to operate and maintain water systems in regional water utilities by developing a nationally consistent trade qualification

Continue to build on the initial progress made under the COAG National Water Skills Strategy to develop a nationally consistent qualification in water treatment and operations with progress overseen by the Water Industry Skills Taskforce.

This would include a review of existing training and trainers to determine opportunities for improvement in delivery. A review process would also be developed to ensure training standards are maintained and that the program is continuously updated in light of new industry developments.

- This qualification should only be delivered by registered training organisations, and improved emphasis placed on the quality of training, via more meaningful and regular auditing, particularly in regional areas.
- To ensure risks posed by under-trained operators are managed, the Australian Drinking Water Guidelines should be amended to ensure, that, at minimum, the lead water treatment plant operator is trade qualified to operate and maintain water systems.

5) Reform the governance structure of regional water utilities in NSW and Queensland

The preceding recommendations can only be effectively implemented in NSW and Queensland if the current governance structures are reformed. Our preferred reform model would see the urban water utility functions currently performed by local government in NSW and Queensland transferred to Government owned Regional Water Corporations, the responsible boundaries of which would match catchments to the extent practicable. Each Regional Water Corporation would be governed by an independent board, with appointments to that board based on expertise in water utility management. The board would appoint the senior management team of the Corporation. The board would report to a relevant Government Minister against a set of conditions set in an operating licence. Compliance with licence conditions would be mandated via relevant legislation.

The larger corporate structure is likely to give rise to increased efficiency. Government would remain the sole shareholder of each corporation. Regional Water Corporations would be large enough to warrant supervision by independent pricing and regulatory authorities in each state, and compliance with licence conditions, including tariff setting, would be formally assessed by those authorities.

There are a number of key advantages from implementing this governance model. First, the Regional Water Corporation Board and management would have unambiguous objectives related to the efficient and effective management of the Regional Water Corporation. In particular, strategic decisions regarding maintenance and capital expenditure would no longer be made by local council General Managers. Second, the larger size of each Regional Water Corporation is likely to have a better of chance of attracting appropriately qualified professional staff. Third, the larger customer base of each Water Corporation means that the expense of 'lumpy' capital assets required to improve water quality and security in smaller towns can be spread across a larger number of customers, spreading the impact from increases in residential bills. Finally, in time, Regional Water Corporations may be able to raise capital on wholesale financial markets in their own right, a funding option that is rarely available to local government in Australia.

There are two Regional Water Corporation ownership models operating in Australia at the moment that could guide decision makers. Victorian Regional Water Corporations are wholly owned by the State Government of Victoria. In Tasmania, recent reform of the urban water sector in that state saw Water Corporations formed that are jointly owned by the councils that fall within the boundary of each Water Corporation.

An alternative to the Regional Water Corporation reform option is the creation of larger State-based utilities (excluding current metropolitan utilities) in NSW and Queensland. However, the potential efficiency gains derived from a utility of this size may be outweighed by the considerably higher costs associated with this method of reform.

A third solution is for "mandatory" regional alliances to be established, governed by a board consisting of representatives from each Council, the State water departments and the Catchment Management Authorities in the region. Precedent for this governance model can be found in the form of the Lower Macquarie Water Utilities Alliance currently operating in NSW. However, this should be seen as an interim stage in the progression towards Regional Water Corporations.

Reform Strategy

Some of the above recommendations are not new ideas and parts of the country will be more prepared for the reform proposed than others. Ease of implementation also varies depending on the current arrangements in that State and the appetite of each Government for water reform.

While we do not believe that linking utility performance to State funding is a favourable means of achieving reform, Commonwealth Government assistance to the States could be helpful in achieving the objectives. To facilitate reform of the regional urban water sector, the Commonwealth Government could consider entering into funding agreements with the States, whereby successful and efficient implementation of agreed reforms by each

State could attract a payment from the Commonwealth, in recognition of the costs of implementing wide-ranging reform.

COAG has agreed to National Partnership Payments (NPP) under the Intergovernmental Agreement on Federal Financial Relations. Such a payment may be used to facilitate or reward nationally significant reforms or to support a specific project.

Though the funding vehicle is different, implementation could be similar to the reform that occurred during the 1990s and 2000s, where each State agreed to implement a range of reforms to various sectors, ranging from reform of governance arrangements for water planning and management, to corporatisation of state-owned electricity and gas utilities. If NPP were used to incentivise and reward reform, COAG would verify that pre-determined milestones and performance benchmarks have been attained before the incentive payment is made.

Where regulation is recommended, implementation should also include a review of the consequences of policy change with respect to the objectives of COAG's Best Practice Regulation guideline.

The program for implementation of the recommendations is as follows:

1) Governance Structure reform in NSW and Queensland

The preferred governance reform option in NSW and Queensland – Regional Water Corporations – should be a priority to allow for timely implementation of the other recommendations outlined in this report within these States. Regional Water Corporations should be implemented within two years.

2) Best Practice Management Framework and Reporting

All water utilities should be required to publicly report on performance via the National Performance Reports within one year, though some may not be able to report on all performance indicators within this timeframe.

The nationally consistent Best Practice Management Framework should be developed and made publicly available within two years. The creation and release of a self-assessment and audit tool for the Best Practice Management Framework should be undertaken within one year of the Framework being made publicly available. The Framework could be regulated or legislated within two years of public release of the guidelines, which would allow governance reform in NSW and Queensland to happen first.

3) Improved Water Pricing

NWC should initiate a review of pricing in regional areas, which will inform development of appropriate pricing models for implementation by utilities servicing regional communities. This review can commence within the next 12 months.

4) Regulation or Legislation of the Australian Drinking Water Guidelines

Requiring mandatory compliance with the Guidelines will need to be tested against COAG's Best Practice Regulation guidelines, and this should be done within one year. Compliance with the Australian Drinking Water Guidelines should then be legislated or regulated within two years of the completion of governance structure reforms in NSW and Queensland.

5) Develop a more highly skilled Workforce

A nationally consistent training qualification for key water treatment and operations staff should be developed by Government Skills Australia within two years and included in the Australian Drinking Water Guidelines within four years.

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Introduction

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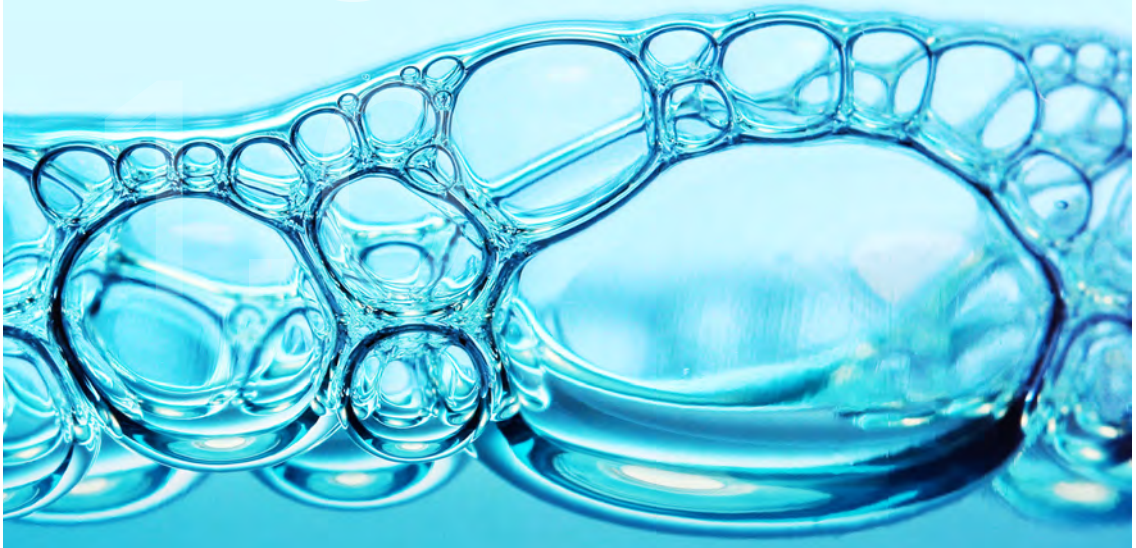


Review of Regional Water Quality & Security

Review & Reform Strategy

Volume 1

1.0 Introduction

1.1 Background

The performance of urban water utilities in Australia's capital cities and larger regional centres is now well understood, thanks to the nationally consistent performance monitoring framework implemented by the National Water Commission and the Water Services Association of Australia in 2007. Every utility in Australia supplying more than 50,000 connected properties now reports on a range of performance indicators, measuring everything from CO_2 emissions to the number of complaints made by their customers. Indeed, as a recent review of Urban Water Security Strategies in Australia demonstrates, the analysis and performance reporting for Australia's major water utilities is comprehensive.

However, the same cannot be said for smaller water utilities, where performance reporting is patchy and inconsistent. Consequently, it is virtually impossible to present a national picture of water quality and water security outcomes for those living in Australia's smaller regional towns. A recent inquiry into the sustainability of non-metropolitan urban water utilities in New South Wales uncovered some worrying trends; 17 of the 106 utilities failed to comply with Australia's water quality standards, while only half of the very small utilities had water conservation and demand management plans in place.

Although the situation in other States has not been documented to the same extent, the restructuring of regional urban water utilities in Queensland and Tasmania over the last five years suggests that there was a strong case for reform. In Victoria, evidence that the small water utilities in that State were unable to consistently supply high quality drinking water was a key driver for sweeping water reform in the latter half of the 1990s.

It is against this background that Infrastructure Australia initiated this review of water quality and water security for Australia's smaller water utilities that serve towns with populations of between 2,000 and 15,000 residents.

It is important to recognise that these utilities are currently operating under increasing external pressures. For many, prolonged drought has been the norm rather than the exception and populations have declined over the past 20 years.

Regardless of the resources available to a utility, there is little that can be done to prevent prolonged drought and declining population. Therefore, this review focused on the systemic and institutional constraints that are seen as barriers to smaller utilities supplying high quality drinking water and achieving supply security.

This review was commissioned to identify opportunities to improve the delivery of safe and secure water supplies to regional communities. Significantly, this review fills a gap in the knowledge surrounding the status of water quality and water security in regional areas, and complements the wealth of information already available for metropolitan water utilities.

This review was restricted to potable (drinking) water in smaller Australian regional towns with a reticulated supply. The size of the towns was limited to approximately 2,000 to 15,000 people, which is considered characteristic of regional communities. Urban water security for metropolitan water utilities was the focus of a separate report undertaken by PricewaterhouseCoopers (PWC 2010).

The two main objectives of the report were to:

- Identify water quality and security problems in regional communities across Australia, and
- Develop an implementation plan with recommendations for practical solutions to rectify the highest priority issues.

1.2 Snapshot of Water in Regional Towns

The delivery of water to regional towns needs to be considered separately to the supply of water to major metropolitan communities, since the issues affecting regional areas are markedly different.

Australia's major cities are well served with respect to drinking water treatment, while many regional areas receive no water filtration, or comparatively less sophisticated treatment.

Metropolitan water resources are generally well understood, as the resources usually supply one water utility and one large community. However, in regional Australia, one water resource may supply a range of towns spanning a number of water utilities and the dominant consumer is typically irrigated agriculture. Therefore planning is more complex due to the interrelationships between what are otherwise distinct water supply networks. While extraction from water resources is managed in each State, the way in which individual Councils or utilities return treated wastewater to the environment is not well controlled. This issue is particularly relevant for inland communities on shared water resources (i.e. river systems).

Table 1 provides an overview of the planning and management responsibilities for potable water in regional towns. From this, it is evident that water prices for regional towns in NSW and Queensland are developed by the local water supplier and are not independently regulated. Queensland is also the only State for which water quality is not regulated by the relevant health department. Water resource planning occurs on a regional basis in some States, but not in others.

Table 1 Responsibility for Water Planning and Management in Regional Towns

State or Territory	Responsibility Area		
	Water Resource Planning	**Water Quality**	**Water Pricing**
Queensland	Department of Environment and Resource Management prepares and manages the plans	Department of Environment and Resource Management	Local Council set, Not regulated
New South Wales	Department of Environment, Climate Change and Water prepare and manage regional plans	NSW Health	Local Water Utility set, Not regulated
Australian Capital Territory	Department of Territory and Municipal Services prepares the plan, Environmental Protection Authority manages the plan	ACT Health	Independent Competition and Regulatory Commission
Victoria	Department of Sustainability and Environment prepare regional water strategies, managed by Catchment Management Authorities	Department of Health Services	Essential Services Commission
Tasmania	Department of Primary Industries and Water prepare and manage plans	Department of Health and Human Services	Economic regulator of Water and Sewerage
South Australia	Regional Natural Resource Management Board develop regional plans, Department of Land, Water and Biodiversity Conservation manage water resources	Department of Health	Set by SA Cabinet, not regulated
Northern Territory	Department of Natural Resources, Environment, The Arts and Sport prepare and manage plans	Department of Health and Community Services Utilities Commission	Utilities Commission
Western Australia	Department of Water prepare and manage plans	Department of Health	Set by WA Cabinet, not regulated

The way in which water is managed and supplied is highly variable across the country. Some States are serviced by one very large utility, while others are served by a large number of smaller, mostly local government based, utilities (see Table 2). In some regions, water resource planning is performed by the State, in others by regional boards. Planning for the delivery of water to consumers may also be performed by individual utilities.

Table 2 Drinking water supply utilities in Australia

State or Territory	Number of Water Utilities[1]	Dominant Water Utility Model
Queensland	72	Local Councils and Regional water utilities
New South Wales	109	106 Local Councils + 3 Metro
Australian Capital Territory	1	Single State-wide water utility
Victoria	16	Regional water utilities (3 Metro + 13 Regional)
Tasmania	3	Regional water utilities
South Australia	1	Single State-wide water utility
Northern Territory	1	Single State-wide water utility
Western Australia	5	Single State-wide water utility + 4 small Local utilities

[1]As of May 2010

Major utilities (more than 10,000 connected properties[1]) are required to report annually in the National Water Commission's and the Water Service Association of Australia's National Performance Report. However, smaller utilities are not captured within this public reporting framework. Some regional towns are captured if they are serviced by a larger utility, however, because the reporting is performed at a whole of utility level, or at a regional level. A consequence of this is that poorer levels of service to small towns are often masked by the average service level for the utility as a whole.

Figure 1 Water Supply Responsibility in Australia

1.3 Strategic Policy Context

As illustrated in Figure 1 the Commonwealth Government drives water reform and policy direction on a national level. However, responsibility for water resources is vested in the States. Although the Commonwealth Government can encourage change and co-ordinate reform, the enforcement powers of the Commonwealth are limited. The ultimate responsibility for regulating the supply of drinking water lies with the States, with water supplied by water utilities at a State, regional or local level. These utilities are individually responsible for delivering safe and secure water supplies to the communities that they service.

The strategic policy document guiding nationally consistent water reform is the National Water Initiative (NWI). The urban water objectives of the NWI are described in Box 1.

[1] The size of a water utility is measured by the number of properties the utility supplies, or "connected properties" as it is commonly known. As multiple people normally reside at a single property, and some properties may not be connected to a town water supply, the population of a community is greater than the connected properties served.

Box 1: *National Water Initiative* Urban Water Objectives

1) Provide healthy, safe and reliable water supplies
2) Increase water use efficiency in domestic and commercial settings
3) Encourage the re-use and recycling of wastewater where cost effective
4) Facilitate water trading between and within the urban and rural sectors
5) Encourage innovation in water supply sourcing, treatment, storage and discharge
6) Achieve improved pricing for metropolitan water

(COAG 2004)

The NWI was primarily concerned with meaningful reform of the rural water sector in Australia. As drought increasingly visited the urban water sector at the turn if this century greater policy attention turned to reform in the sector. These include:

- COAG Work Program on Water (COAG 2008a)
- Various *Water for the Future* work programs
- National Urban Water Planning Principles (COAG 2008b)
- National Water Initiative Pricing Principles (COAG 2008b)
- Strengthening Basin Communities program
- Water Smart Australia
- Water Industry Skills Taskforce
- Water Efficiency Opportunities program
- National Urban Water and Desalination Program
- Infrastructure Australia's Report to COAG

1.4 Our approach to undertaking this review

Infrastructure Australia engaged AECOM to:

- Identify the regulatory frameworks and requirements for water quality in regional Australia
- Identify the standards of water quality being achieved
- Identify any significant risks
- Analyse causes of any gaps between required and actual standards
- Identify where water security is a significant issue
- Identify what, if anything, needs to be done
- Identify whether there are effective models available to address the issues
- Identify and prioritise action to improve regional water quality and security and identify how those actions should be implemented

For the purpose of this report, the provision of a drinking water supply that is healthy and secure means that the water supply will:

- Be fit for purpose (primarily consumption)
- Be there when needed
- Be reasonably affordable to consumers
- Be managed in a way that demonstrates adequate planning for climate change and growth
- Not adversely impact environmental water requirements.

AECOM followed a five stage process in undertaking this review. A summary of each stage is outlined below.

Stage one – Selection of water utilities

To determine which towns would be used to demonstrate the water quality and/or security issues faced by regional communities in Australia, Census data was used to determine the size of the town and utility information was used to determine if the town was on a reticulated supply.

This resulted in a total of 101 regional towns with population between approximately 2,000 and 15,000 were investigated. The locations of the towns are shown in Figure 2.

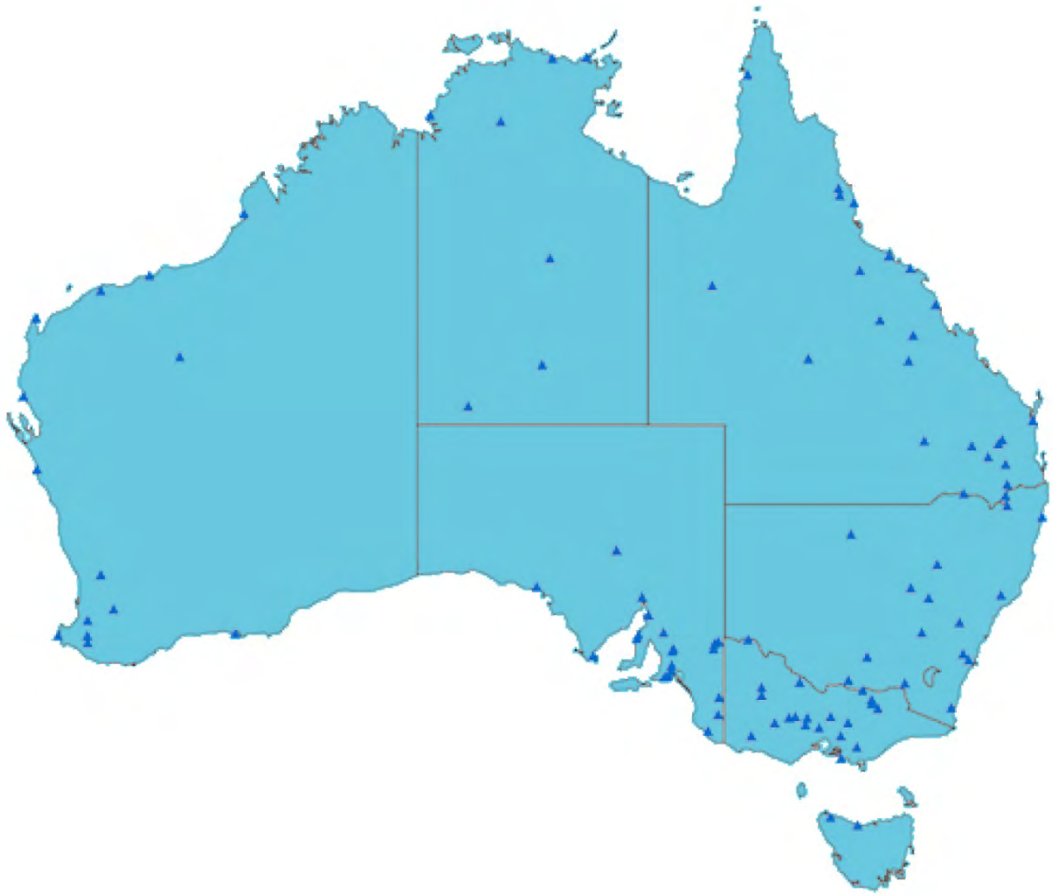


Figure 2 Location of regional towns included in this review

The number of towns within each State that fell in the target population range varied considerably. The towns selected in Tasmania, Victoria, South Australia, Western Australia and the Northern Territory captured almost all the towns within the population range. In New South Wales and Queensland, there are more towns within the population range that could not be investigated given time constraints. In those States, towns were chosen for their known or likely water quality and/or security issues. Therefore, it should be noted that the towns investigated are not a standard sample and, as such, the data may be statistically skewed. The information was gathered to provide an indication of the largest risks to water quality and security, rather than the likelihood of those risks.

The number of towns selected from each State is shown in Table 3.

Table 3 Number of towns selected for investigation by State

State or Territory	Number of Towns
Queensland	22
New South Wales	18
Victoria	18
Tasmania	2
South Australia	20
Western Australia	14
Northern Territory	7
Total	101

Stage two - Comprehensive review of available data and analysis of smaller water utilities in Australia

To facilitate issue identification, data was gathered on water quality and security related parameters for a number of regional towns. Towns satisfying the scope were then investigated for known water quality and security issues and selected for further analysis if they demonstrated problems. General information pertaining to water quality and security in country towns was used to identify broad trends.

It became clear that there is little consistent, publicly available performance information on towns that fell within the target population. As a result, AECOM undertook a stage of primary data collection and stakeholder consultation to fill this gap.

Stage three – Data collection and stakeholder consultation to fill data gap

The primary report on water utility performance is the annual National Performance Report (NPR), which is compiled by the National Water Commission and the Water Services Association of Australia. The utilities included in the NPR are considered metropolitan water suppliers and serve more than 10,000 connections. Reporting is performed on a utility basis (or on large regional areas of the utility), and as such, does not highlight issues in specific towns where a utility has a multi-town service. The reporting includes 150+ items of compliance data, covering a range of water business, quality, reliability and security parameters.

While it would be logical to follow the format of the NPRs and collect information in line with the existing criteria, it was determined at the outset of the Review that the information available for regional towns was comparatively limited. The investigation process therefore involved using a standard town profile template (Appendix C) to collect a range of information on water quality and security. The template includes information fields such as source water, treatment, and compliance with ADWG, as well as a range of less quantitative risks, such as the type of water source, or whether the town was a tourist area or supported large industry. As expected, the availability of and access to data and information varied across the States.

Stakeholders engaged during the consultation process included state and federal government agencies and industry based associations. It should be noted that the Water Corporation (Western Australia) elected to not participate in this investigation, comprehensive town profiles were not collected for Western Australia. Rather, information available in public documents was relied upon for any discussion of Western Australian towns.

A draft list of potential solutions was developed based on successful strategies that have been implemented in the metropolitan water supply authorities, known government proposals, industry expert advice our own team's extensive knowledge and understanding of the water industry. The issues identified and potential solutions were then presented in workshops to stakeholders, with feedback, opinions and ideas sought and captured to formulate the final suite of proposed solutions.

Stage four – Synthesis and analysis of data and findings

The data collected during Stages 2 and 3 was synthesised and analysed in order to identify the systemic barriers to small urban water utilities providing high quality and secure water. The results of this analysis are presented as key findings in Section 2.0 of this report.

Stage five – Recommendation and reform agenda

The key findings suggest that there is a clear need for reform of the urban water sector servicing Australia's smaller regional towns. A number of recommendations and a reform agenda was developed, these are contained in Sections 3.0 and 4.0 of the report, respectively.

1.5 Structure of report

Volume 1 – Review and Reform Strategy

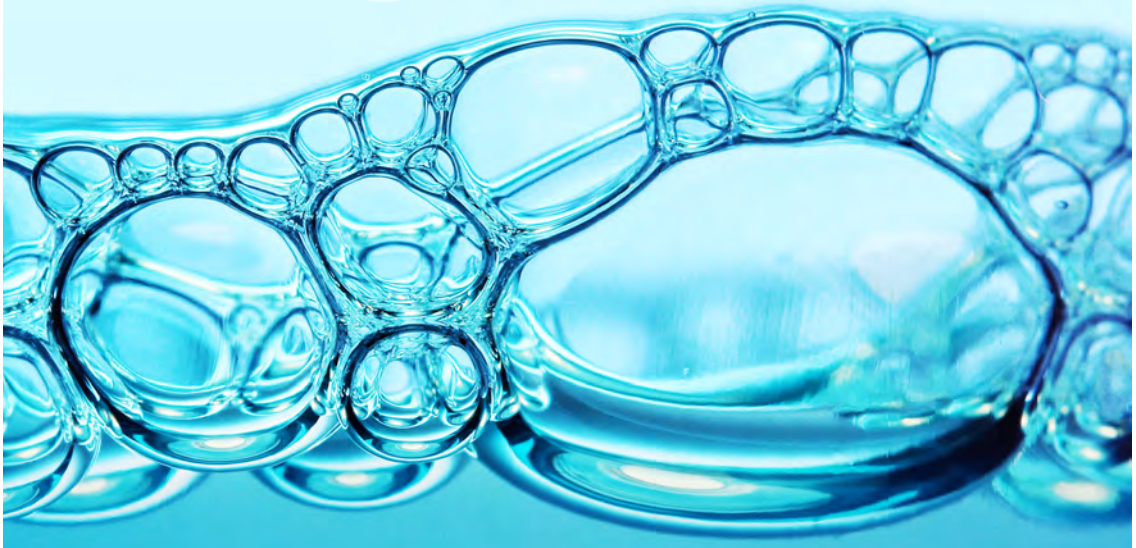
- Section 1 – Introduction
- Section 2 – Key Findings and Evidence
- Section 3 – Recommendations
- Section 4 – Reform Strategy
- Section 5 – References

Volume 2 – Appendices

AECOM

Key Findings and Evidence

2.0



Review of Regional Water Quality & Security

Review & Reform Strategy

Volume 1

2.0 Key Findings and Evidence

2.1 Pricing is only Part of the Problem

While less than full cost recovery by some water utilities contributes to the inability to deliver safe and secure water supplies in regional communities, it is only part of the problem.

Less than full cost recovery is a common feature of water utilities servicing regional areas. However, even those utilities that earn sufficient revenue to allow a dividend payment to State Government shareholders sometimes fail to supply high quality water with acceptable security.

This suggests that under the current governance arrangements there are insufficient incentives for water utilities to meet their minimum water quality and water security service standards. It also implies that basing future changes to governance arrangements on the generation of economic resources is unlikely to be effective in isolation. Potential governance reforms to this sector should require utilities to meet performance standards, include mechanisms that transparently verify utility performance, and provide training to build knowledge and enable change.

2.1.1 Supporting Evidence

The data collection and analysis undertaken for this review indicates that enabling cost reflective pricing will not necessarily solve all the water quality and water security issues faced by regional towns. The water quality and water security evidence collected (best demonstrated in Section 2.3 and Section shows that safe and reliable water supplies are not fully achieved in any State. All States demonstrate water quality results non-compliant with the ADWG and have experienced extreme water shortages. This is so even where water is supplied by a larger water utility that is better equipped to recover the costs of supplying water to consumers, and independently regulated, returning profits to their respective State governments.

This is not to say that pricing practices could not also be improved. The finding is that while the approach to pricing water in regional towns needs to be revisited, there is also an obligation to ensure that the way in which water funds are used is well managed, planned and understood. Appropriate frameworks are therefore required to ensure the best and most efficient use of water funds by water utilities.

A case study to demonstrate this is the amalgamations in Victoria. While the benefits of improved economies of scale and subsequent pricing practices were well recognised when over 370 water service providers were amalgamated to 12 in 1994, the amalgamations did not generate equal improvement across the state. Poor water quality and water security planning are still evident in some parts of the State. The issue of how to price water supplied to regional communities has also been challenging, with some controversy regarding larger communities subsidising smaller ones. However, overall the improvement generated by governance reform in Victoria has been significant.

Box 2: Operating Profits in Victoria

The forecast operating revenue for Victorian Water Utilities nearly doubled from 2008/09 to 2009/10. This has been driven predominantly by increases in pricing approved by the Essential Services Commission in 2008, rather than an increase in volumetric sales.

However, given challenges to water availability, the overall operating profit forecast was for a loss of nearly $45M across the 15 utilities for 2009/10.

This highlights the need for a strategic outlook and robust pricing models to ensure that reduced operating profits do not limit planned expenditure on new and existing infrastructure.

Source: Downie 2009

2.2 Inadequate Pricing Practices

Pricing water in order to recover the full cost of supply is currently difficult to achieve in many regional towns.

There is high variability in the price paid for water across regional communities. This is a result of many factors, including costs, but also pricing policies. On the cost side, the size and density of the water supply network, the capital cost for infrastructure in smaller towns and the per capita volume of water consumed are key factors. The relative expense of supplying water infrastructure to small towns often means that capital projects are unviable for the water utility. For example, many small towns are without water treatment because the increase in residential bills to recover the cost would be substantial.

Pricing is a difficult issue, particularly because of community and local government sensitivity to price increases. However, many utilities servicing regional towns are not recouping the costs of supplying water, let alone providing for capital improvements. Many are charging prices significantly lower than in major urban areas, where economies of scale would be likely to mean lower cost. Without pricing reform, at least to cost reflective levels, many regional water utilities – even the larger ones – will remain unsustainable and water quality and security will suffer as a result.

Cross-subsidisation is a principle that needs to be acknowledged in the pricing discussion. Some utilities that service a larger geographic area spread the cost of water supply amongst all consumers – a solution not always supported by the larger regional or metropolitan communities that ultimately pay more for water to ensure neighbouring towns are serviced by safe and secure water supplies. Cross subsidisation using 'postage stamp pricing' is a principle that is applied in virtually all major urban water utilities as one of the costs that comes with the benefits of economic scale. Many regional communities benefit significantly from the application of this principle to the provision of mail and telephone services. Australians have broadly accepted the application of this principle in the water sector and this position needs to be recognised when sections of the community argue that they may be disadvantaged by this approach.

2.2.1 Supporting Evidence

It is clear that consumers value high quality drinking water, because many are willing to pay more than 500 times the reticulated supply price for bottled water (BCA 2006), even though the quality of bottled water may be no better.

Water pricing can play a significant role in raising revenue and reducing water consumption. The Australian Water Association (AWA 2001) declared pricing to be the most likely "magic bullet" to drive change in water management. For example, the introduction of metering and consumption-based pricing, as agreed under the National Water Initiative (NWI) Clause 64 (COAG 2004), resulted in reduced consumption where implemented.

However, under current pricing practices, funds are transferred from utilities to the government, often at the expense of new infrastructure, repair and replacement. Water utilities that are operated as part of the local government structure experience rate pegging, reducing their ability to recover the cost of supplying water to consumers.

Not only is the per kilolitre price of water highly variable, but so are the models used. Some regional town water charges are structured according to a flat rate per kilolitre[2], whereas others are under a step-wise pricing arrangement. Stepped pricing structures were developed to provide incentive for the consumer to monitor and regulate their water use such that they don't exceed the stepped thresholds. However in many communities, the lower tier price is below the cost of delivering water, with upper tier use insufficient to make up the difference.

In order to enable comparison of pricing amongst towns selected for this Review, towns with a flat rate were compared with the Tier 1 price of towns under a step-wise structure, which is the price paid by most residential users (Figure 3). If the data point of $11/kL is considered an outlier, the range of water rates is $0.70/kL to $2.30/kL, which is still a difference of 300%.

[2] 1 kilolitre is equal to 1000 litres

The difference in water rates across the selected towns is the result of a number of factors, including frequency and volume of rainfall, availability of supply, water licence agreements and allocations, raw water quality, proximity to water supply, level of treatment, infrastructure construction and maintenance, number of connections and external regulatory and pricing requirements.

The average Tier 1 price charged by the urban utilities (according to the National Performance Report 07-08, WSAA, NWC & NWI Parties 2009b) is also presented in Figure 3 for comparison, along with the maximum and minimum prices.

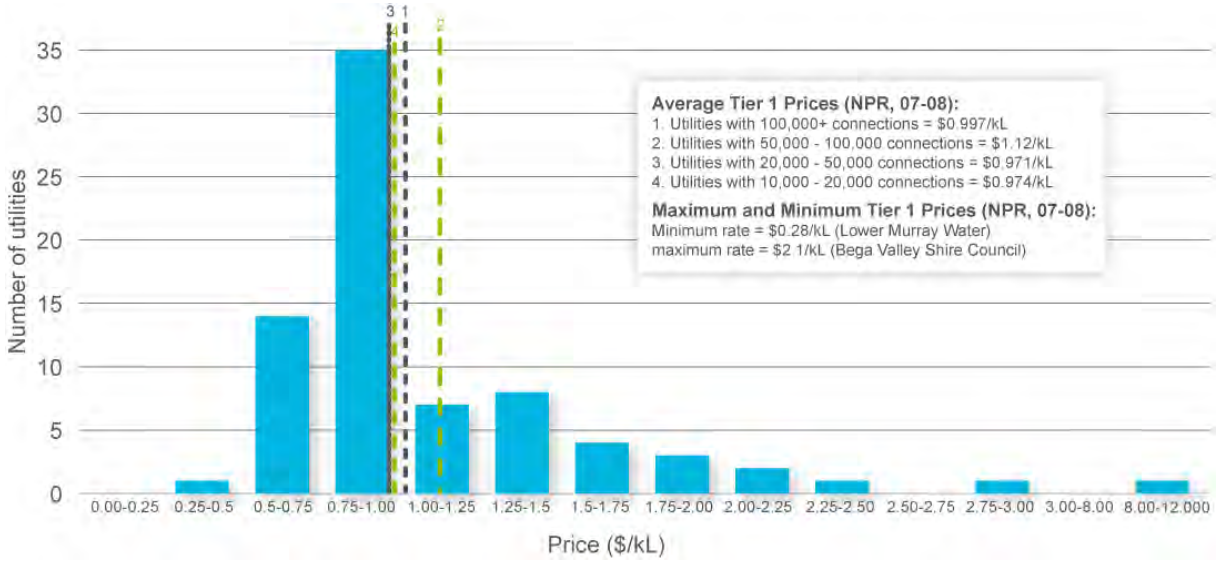


Figure 3 Flat rate or Tier 1 price of water for the selected regional towns, with the average Tier 1 price for each major utility category, and the maximum and minimum Tier 1 prices, as stated in the National Performance Report (2007-08)

The per kilolitre cost of water is a key component in the development of the typical residential water bill, which at the very least, should achieve full cost recovery for the annual works of the water supply business. Full cost recovery is not being achieved by some LWUs in NSW (Armstrong and Gellatly 2008), yet this is recognised as an integral factor in the financial sustainability of a water utility.

In addition to operations and maintenance costs, a water utility should be able to raise the capital for any alterations or additions to their existing system to respond to changes in technology, regulation, climate and community expectations. Even in the event of obtaining funding support from State and/or Commonwealth governments, a water utility should raise a significant proportion of the total required funds.

The ability to raise these funds depends somewhat on the number of connections served by the water utility. For a water utility servicing a very small population, constructing a water treatment plant has a high per person cost and it may take many years to raise the funds under existing structures. If the water utility serves a larger population, economies of scale can significantly reduce this per person construction cost.

The range of connections for the systems included in this study, listed by State is:

- Queensland: 220 to 9,900 connections
- NSW: 2,000 to 20,000 connections
- Victoria: 608 to 6,900 connections
- South Australia: 2,200 to 10,000 connections
- Northern Territory: 250 to 7,600 connections
- Western Australia and Tasmania: unknown

Some regional towns are serviced by a larger water utility with multiple towns on the same supply system. However, the low connection figures for the towns listed above demonstrate that many regional towns are the only town on the local water supply scheme. This arrangement reduces the capability to draw upon economies of scale associated with servicing larger areas. This issue is most significant in NSW and Queensland, where the water utilities are generally local government operated; a model that potentially prevents nearby communities from being connected because they are run by separate water utilities. This does not take into account the other efficiencies that can be recognised through shared services and access to greater resources.

2.3 Non- Compliance with ADWG

Water utilities servicing regional communities struggle to implement and comply with the Australian Drinking Water Guidelines – this is particularly so for smaller water utilities.

This is due to:

- Comparatively fewer human and financial resources, which is being exacerbated by declining population
- Relatively lower availability of technical knowledge and expertise
- Strong competition for skilled employees in regional areas
- Inadequate infrastructure to treat water and preserve water quality
- Poor processes for operation and maintenance of existing treatment infrastructure
- Lack of reporting and insufficient institutional incentive for utilities to comply with guidelines and licence requirements

Some regional communities are consequently exposed to a greater risk of illness from pathogens, algal toxins and other physical and chemical contaminants. A few utilities have detected trihalomethanes in their treated water supply, which may be carcinogenic to humans. Sections of the community with weakened immune systems are particularly at risk.

Although there have been no recorded deaths directly attributed to contaminated potable water in regional Australia, numerous 'boil water' notices and severe outbreaks of water quality related illness have been recorded in regional Australia.

2.3.1 Supporting Evidence

During this Review, a substantial amount of data was collated on water quality and the ability of water utilities to deliver safe drinking water to regional consumers. While some states achieve better water quality than others, improvement is required across the country. Most States impose licence requirements on water utilities to encourage compliance with water quality parameters as per the ADWG, however, few States regulate adherence to the risk based framework set out in the ADWG. This framework aims to ensure the inherent risks within a system are identified and removed or managed.

Some of the evidence collected to demonstrate the standards of water quality being achieved, and hence the improvement still required, is provided below.

2.3.1.1 Water Treatment

In general, the level of treatment in the sampled regional towns is far below the level of treatment available in the metropolitan areas of Australia, where conventional treatment is used as a minimum.

The wide variety of treatment types used by the towns for review is shown in Figure 4, the most common being conventional treatment[3]. Figure 5 shows the level of treatment for the towns that draw water only from surface water supplies.

It was found that 13% of the selected towns have disinfection only. The 2008-09 performance report for Victoria demonstrates that 53 localities on surface water supplies receive disinfection only. This is a high risk scenario due to potential for hazardous trihalomethane (THM) formation in the absence of filtration.

The absence of treatment in one town poses an extremely high risk as there are no barriers to microbial, pathogenic, viral, or chemical contamination.

Due to their accessibility, surface supplies are also more readily affected by chemical pollutants via storm-water runoff and industrial activity in comparison to groundwater supplies.

[3] This is a generic term for treatment that incorporates multiple processes such as coagulation, sedimentation, filtration and disinfection.

The level of treatment on some surface water supplies is inadequate. Communities are at risk of being exposed to harmful disinfection by-products, cyanotoxins and pathogens.

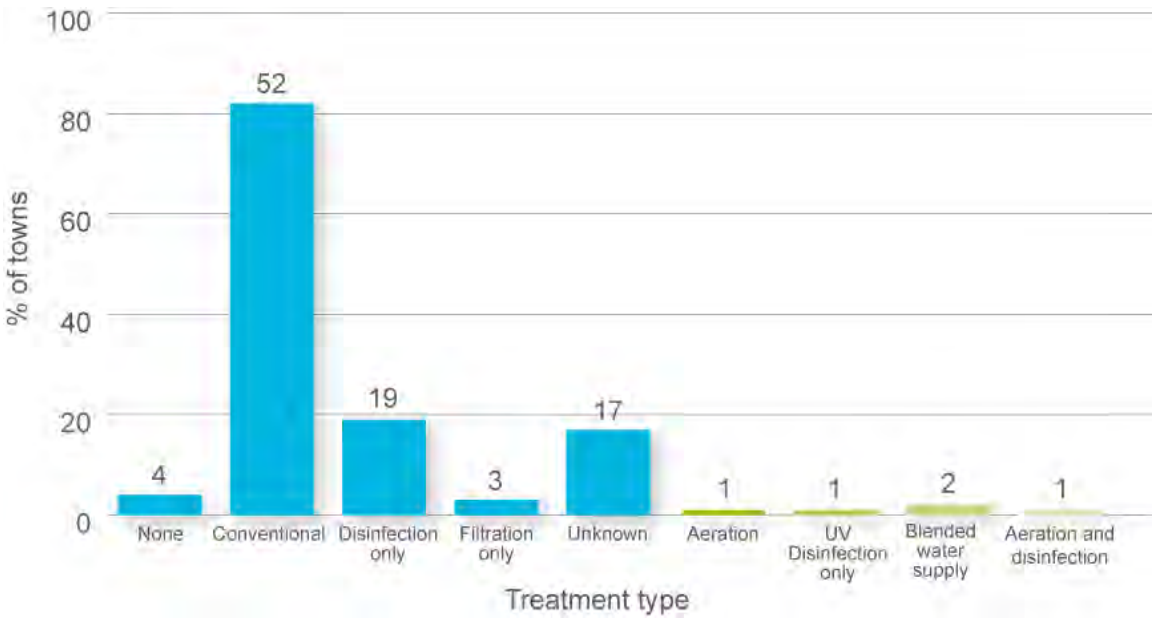


Figure 4 Level of treatment in the selected regional towns

Box 3: Trihalomethanes (THMs)

Trihalomethanes are present in drinking water principally as the result of disinfection using chlorination or, to a much lesser extent, chloramination.

The International Agency for Research on Cancer has concluded that chloroform and Bromodichloromethane (THMs) are possibly carcinogenic to humans.

Precursors for THM formation can be removed by activated carbon, by coagulation followed with filtration, or by oxidation with ozone or potassium permanganate.

Source: NHMRC 2004

Algal blooms are relatively common on large open storages, particularly in summer months. During a bloom, the algae may produce cyanotoxins, which are damaging to human health and difficult to detect (Box 4). The detection method is usually taste and odour in the water, which is often not identified until customer complaints are received.

Box 4: Cyanotoxins

Four groups of cyanotoxins are described by the ADWG; Cylindrospermopsum, Microcystins, Nodularin and Saxitoxins. The potential health impacts of cyanotoxins include injury to the lining of the gastrointestinal tract and blood vessels, liver and kidney damage, haemorrhage and death.

The cyanotoxin *Cylindrospermopsin* is believed to have been the causative agent in the Palm Island "mystery disease" poisoning incident in Queensland in 1979, in which 148 people were hospitalised, and recent cattle deaths in Queensland has also been attributed to this toxin.

In 2000, a cyanotoxin contamination event occurred on the Yorke Peninsula in South Australia in April, 2000. Bottled water was supplied to consumers for drinking and cooking, and carted water was provided to hospitals and nursing homes.

Source: NHMRC 2004

A. circinalis (a type of saxitoxin) is the most common organism in riverine blooms in the Murray-Darling Basin. The most publicised bloom of *A. circinalis* occurred in late 1991 and extended across more than 1000 km of the Darling-Barwon River system in New South Wales. A state of emergency was declared, with a focus on providing safe drinking water to towns, communities and landholders.

The quality of some surface supplies is highly sensitive to climatic variations. High rainfall following a dry period leads to an increase in turbidity, which can compromise the quality of disinfection only supplies. Similarly, low levels in storages may impact upon quality and compromise the effectiveness of water treatment. Because of this, treatment plants need to become more adaptable to a range of raw water qualities.

Of the selected towns that use groundwater, 44% have disinfection only, 12% of have no treatment and another 12% have conventional treatment. Figure 6 shows the level of treatment for the sampled towns that draw water only from bore water supplies. The 2008-09 performance report for Victoria demonstrates that 14 localities use groundwater that receives disinfection only.

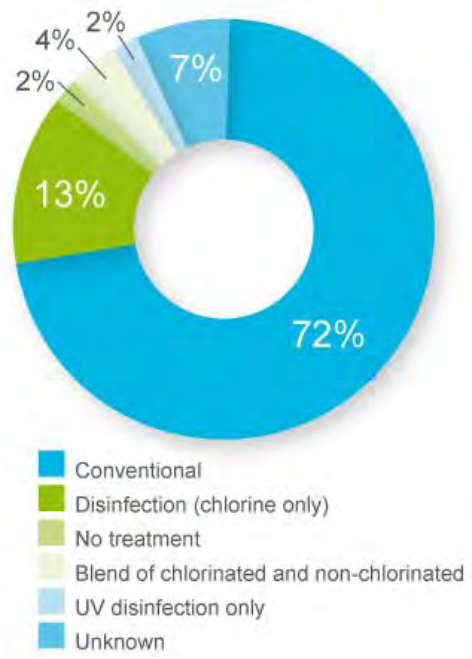


Figure 5 **Percentage of towns using a particular level of treatment for surface water only supplies**

Groundwater supplies are perceived to be less susceptible to faecal contamination. However, the *E.coli* contamination event in Walkerton (Canada) illustrates the potential vulnerability of groundwater supplies (Box 6). The consequences of this event were severe, both in terms of deaths and illnesses, as well as economic loss through decreased productivity.

Box 5: Risks to public health

This picture of cattle wading in a creek, was taken just metres upstream of a raw water intake. This drinking water supply currently receives only chlorination disinfection for treatment. The public health risk associated with this scenario is very high. Numerous water industry professionals have confirmed that this is not an uncommon sight in some regional areas.

Groundwater supplies can be vulnerable to contamination. The level of treatment must be appropriate for the level of risk posed by the source. Single treatment measures such as aeration are unlikely to provide a sufficient level of protection.

The cryptosporidium contamination event in North Thames (UK) also demonstrates that groundwater supplies can be susceptible to pathogens (Case Study[4] 6, Appendix K). The selected regional towns that do not have disinfection may be at risk of a similar contamination event, particularly where there is nearby agricultural activity or risk of sewer overflows near an unconfined aquifer.

Groundwater supplies experience challenges associated with high levels of natural mineral pollutants such as iron and manganese. In most situations, natural mineral pollutants are not a direct health risk but they can have an indirect affect by reducing the effectiveness of disinfection. However, nitrate and nitrite ions[5] can cause methaemoglobinaemia to which young infants, pregnant women and people with a deficiency of glucose-6-phophate dehydrogenase or methaemoglobin reductase are most susceptible (NHMRC 2004).

For the sampled towns that had a supply based on both surface water and bore water, nine of the twelve towns had conventional treatment, one had filtration only, and one was unknown. The town with filtration only is a high risk due to the factors mentioned previously with regard to surface water supplies.

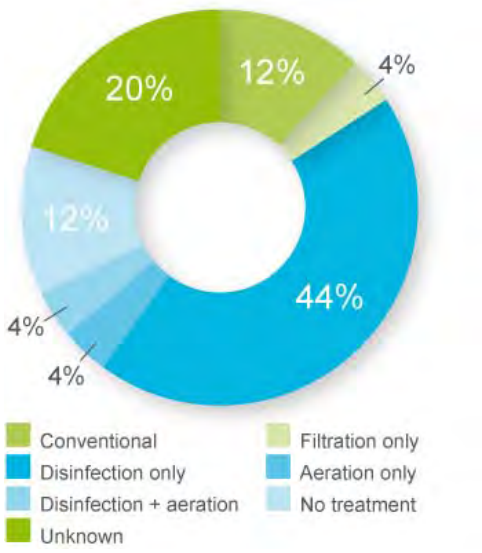


Figure 6 **Percentage of towns using a particular level of treatment for bore water only supplies**

Box 6: The Walkerton Incident, Ontario, Canada

In May 2000, the Walkerton (Southern Ontario, Canada) drinking water system became contaminated with *E.coli* and *Campylobacter jejuni*. Seven people died and over 2,300 people became ill with bloody diarrhoea, stomach pain and nausea. Some victims, particularly children may experience lasting health effects from the contamination event.

An inquiry into the event found that the primary source of the contamination was manure that had been spread on a farm near a drinking water well. The contamination event could have been prevented if continuous chlorine residual and turbidity monitors were in place (O'Connor, 2002).

Reconstructing the community's water supply is reported to have cost around $11 million, while the estimated total cost of the contamination event was $155 million by 2001 (Meinhardt, 2002, cited in Meinhardt, 2005).

(See Case Study 4, Appendix K for more information)

2.3.1.2 Water Quality Results

Queensland

In Queensland, typical water quality results for fluoride, pH, chlorine residual, alkalinity, hardness and turbidity were provided for 6 of the 22 towns selected. This information was mostly representative of towns located in the north of the State. All of these towns were reported as 100% compliant for the reported parameters.

The data gaps for Queensland are due to a widespread lack of reporting, which is presently being addressed with the introduction of the Queensland *Water Supply Safety and Reliability Act 2008* and recent governance reforms.

The popular tourist region of Port Douglas reportedly experienced a highly publicised drinking water contamination event in September 2008 (see Box 7).

[4] Case Studies are intended to illustrate examples of incidences that have occurred and were not relied upon in developing the key findings and recommendations. Though information has been collated from sources other than media outlets, the accuracy of all information referenced has not been confirmed.
[5] Nitrate and nitrite ions are naturally occurring oxides of nitrogen

Box 7: *E.coli* in Port Douglas, Qld

In September 2008, *E.coli* was found in seven of the thirteen Port Douglas and Mossman reservoirs, prompting Queensland Health to advise that residents in Port Douglas, Craiglee, Mowbray, Rock Point and Daintree Village to boil drinking water until further notice. Following discovery of the contamination, seventeen people presented at Mosman Hospital with gastroenteritis symptoms, with six admitted for overnight observation.

Open areas and damaged roofs on the reservoirs were highlighted as the possible point of contamination.

(See Case Study 2, Appendix K for more information)

New South Wales

In New South Wales, contamination by *E.coli* and Lead were the most significant health-related non-compliances recorded (Table 4). The incidences of Total Coliform contamination may indicate an inability to maintain a chlorine residual, inadequate treatment, or potential re-contamination of treated water supplies.

During 2007-08, 22 “boil water” alerts were issued in NSW over the 25 months to June 2008 (Armstrong and Gellatly 2008). Boil water alerts indicate a suspected or confirmed microbial contamination.

The popular ski holiday destinations of Jindabyne and Smiggin Holes experienced a highly publicised microbial contamination incident in 2009. Approximately 120 guests became ill as a direct result of contaminated drinking water at Smiggin Holes, while a sewer overflow into Jindabyne’s drinking water supply went un-detected for three days (Case Study 1, Appendix K).

Table 4 Non-compliances for the selected towns in NSW, 2007-08 period

Non-compliant Parameter	Number of Selected Towns	Range of Compliance
Total Coliforms	17	11% - 99%
E.coli	6	95 %- 98%
Lead	1	83%
TDS	2	50% - 78%
Turbidity	1	92%

Note: One town can have more than one non-compliant parameter.

Detailed water quality information indicates that regional water utilities in New South Wales have difficulty complying with the Australian Drinking Water Guidelines for a range of parameters. Repeated incidences of *E.coli* and Total Coliform contamination indicate treatment is inadequate and re-contamination may be occurring in water distribution networks.

Some important parameters including potentially carcinogenic disinfection by-products are not tested, due to financial and resourcing constraints. Some communities in New South Wales oppose disinfection with chlorine due to concern regarding by-products.

Victoria

Six of the 18 towns sampled in Victoria had issues with THM formation (see Table 5). Other disinfection by-products such as Dichloroacetic acid and Trichloroacetic acid were detected. The detection of these contaminants in Victoria and not in other States may be attributed to the fact that Victoria generally undertakes more rigorous testing. It is possible that improved monitoring and testing practices in other States would produce similar results.

Water supplies to five of the 18 selected towns in Victoria were affected by algal blooms in the 2007-08 reporting period, while three of the selected towns issued “boil water” notices.

Table 5 Non-compliances for the selected towns in VIC, 2007-08 period

Non-compliant parameter	Number of Selected Towns
THMs	6
Ammonia	1
Benzo(a)pyrene in raw water	1
E.coli	1
SS/Turbidity	6
Dichloroacetic acid	1
Trichloroacetic acid	1

Note: One town can have more than one non-compliant parameter.

Tasmania

Water quality information was not readily available for towns in Tasmania. However, utility website, reports, newsletters and news articles[6] reported that numerous towns had been or still were on boil water alerts. The Tasmanian Water and Sewerage Industry Report revealed that in 2009 there were 38 towns on boil water alerts, 24 of which were permanent.

Significant work is now underway to address historical water quality issues; the Tasmanian government has committed $1B over the next 10 years to improve water treatment, distribution and storage systems with numerous projects already underway.

South Australia

Three of the 20 towns selected in South Australia had high levels of THMs, as shown in Table 6. These were towns supplied by a reservoir thought to have high organic loads. The non-compliances with Faecal Coliforms are thought to be due to bores without disinfection being connected to the water supply networks.

Table 6 Non-compliances for the selected towns in SA, 2007-08 period

Non-compliant Parameter	Number of Selected Towns	Range of Compliance
TDS	5	0-86%
Turbidity	4	59-99%
THMs	3	66-96%
Faecal Coliforms	2	98-99%

Note: One town can have more than one non-compliant parameter

The detection of particular contaminants in the sampled regional towns of Victoria and South Australia does not necessarily mean they experience poorer water quality. More rigorous testing is conducted in Victoria and South Australia and public reporting is more transparent. Similar results may be identified if sampling and reporting is improved in other States.

Western Australia

Specific water quality information was not received for Western Australia. The Water Corporation in WA indicated that all of the selected towns have 100% compliance with ADWG 1987, whereas to the other States use ADWG 2004. WA's use of thermotolerant coliforms as an indicator is out-dated, with *E.coli* is now more commonly used to indicate microbial risk as it can be used to distinguish between environmental thermotolerant coliforms and faecal contamination.

[6] While the accuracy of this information has not been verified, it is widely known that numerous Tasmanian towns have been on permanent or temporary "boil water" alerts. This number is decreasing through

Northern Territory

Three of the seven towns selected in the Northern Territory showed non-compliance for total coliforms, indicating inadequate treatment, poor disinfection or recontamination issues. Two towns had non-compliances for *E.coli*, while one town had non-compliances for iodide (Table 7).

Table 7 Non-compliances for the selected towns in NT, 2007-08 period

Non-compliant Parameter	Number of Selected Towns	Range of Compliance
Iodide	1	Unknown
Total Coliforms	3	85-99%
E.coli	2	98.4-99%

Note: One town can have more than one non-compliant parameter.

Box 8: Cryptosporidiosis

In 1997, 345 people were confirmed to be suffering cryptosporidiosis due to a large waterborne outbreak in North Thames, UK. Studies carried out by Willocks et. al. (1998) indicate that the outbreak was attributed to one groundwater borehole.

(See Case Study 6, Appendix K for more information)

In NSW Australia, 1,540 cryptosporidiosis cases were recorded between 1997 and 2000, 239 of whom required hospitalisation.

Source: Menzies 2002

2.3.1.3 Monitoring and Reporting Issues

To take into account the relative risk associated with system complexity and the number of people exposed to contaminants, the general approach to water quality compliance monitoring and testing under the ADWG is that the number of water quality samples and the range of parameters to be tested decreases as the complexity of the water supply system decreases. This means that contamination events may not be picked up in regional areas due to the lower frequency of sampling and the reduced range of parameters that are sampled.

Water quality compliance monitoring varies significantly across the States. For a large proportion of supply systems, testing is infrequent and the range of parameters is small, particularly in comparison to metropolitan utilities. Utilities may be missing contamination events due to the method of testing, and the risk to communities may therefore be higher than what is reflected in the water quality results.

Therefore, in the event that there is contamination, there is a high probability that it will reach the community before detection due to the relatively low frequency of compliance testing. This poses a considerable risk to community health.

The cryptosporidium contamination event in Milwaukee, USA, is a severe example of the consequences of inadequate contamination detection methods (see Box 9).

Box 9: The Milwaukee Incident, USA

In 1993, Milwaukee (USA) experienced a large outbreak of waterborne cryptosporidiosis when Cryptosporidium oocysts passed from Lake Michigan through the filtration system of one of the city's water treatment plants (William et. al., 1994). The event was attributed as the underlying or contributing cause of death in 54 residents (Meinhardt, 2005). William et. al. (1994) report that an estimated 403,000 residents (or 52% of the population) developed diarrhoea as a result of the outbreak. Over 4,000 residents required hospitalisation (Meinhardt, 2005). The outbreak went undetected for the period between 23rd March and 9th April because the water quality standards and testing of patients for cryptosporidium were not adequate to detect the outbreak.

(See Case Study 5, Appendix K for more information)

Free chlorine is not included in compliance monitoring for some of the selected regional towns that are using chlorination for disinfection. This means it is very difficult to verify the accuracy of dosing, identify problems in the reticulation and ensure the reliability of the disinfection process[7].

Pesticides and herbicides are not included in compliance testing for many regional towns. The ADWG recommends monthly testing where pesticides have been previously detected or where their use indicates detection would be likely. Considering the proximity to agricultural areas for many of the selected towns, contamination events may be going un-noticed, jeopardising the health of the community. Herbicides were detected in one drinking water supply in Tasmania and the likely source was an adjacent pine plantation. Herbicides have also been detected in water supplies in other parts of Australia.

If a large number of samples are taken, then the good (i.e. compliant) results can "hide" the isolated bad results; a high overall "% compliance" is reported, providing a false confidence in the safety of the drinking water supply.

An additional complexity is that the statistics that are reported vary significantly between the States, making it impossible to compare utilities on a national level without further detailed analysis.

Some performance reporting does include additional compliance parameters such as the number of supply zones that are compliant, the percentage of the population for which compliance was achieved and distinction between chemical, microbiological and physical/aesthetic parameters. However, as demonstrated above, further detail and a consistent approach is required to provide a transparent and accurate measure of compliance.

Water quality compliance results for regional water utilities are generally reported on an annual basis by the relevant body in each state or territory. Key information such as the number of samples taken and the location of sampling is often ambiguous or omitted, making it difficult to judge the limitations of the reported results. This is particularly relevant when a limited number of samples are being taken.

2.3.1.4 Other Key Risk Factors

Other key risks to water quality that are not embodied in the water quality compliance results are shown in Table 8 and described below.

Table 8 Water quality risk factors unique to the selected regional towns

Risk	% of Selected Towns With Water Quality Risk Factor
Extensive agriculture	54
Low vegetation cover	46
Fauna defecating in supply	44
Flooding	35
Poor quality water source	26
High natural mineral pollutants (e.g. uranium, nitrates, iron, fluoride)	25
Aging or inadequate pipe work and associated infrastructure	22
Algal blooms	22

- Extensive agriculture –Proximity to agriculture is a potential risk for water quality due to stock using waterways and through runoff from cleared land. Runoff can wash manure, sediment, fertilisers, herbicides and pesticides into the drinking water supply.
- Low vegetation cover –Low vegetation cover can be due to land clearing or it may be a natural feature of the local environment. This can lead to high sediment loads in surface water supplies, which can cause a decline in water quality. A high proportion of the selected regional towns do not receive their source water from protected catchments, in contrast to metropolitan areas.

[7] If there is insufficient chlorine residual in the distribution system, disinfection cannot be reliably maintained.

- Fauna defecating in supply – This is a widespread risk for regional towns using surface water supplies. This risk can be managed through adequate treatment, which is provided in metropolitan areas. The prior analysis of surface water treatment for the selected regional towns suggests that this is not provided in some regional areas (see Section 2.5).
- Flooding – This is a significant risk to drinking water supplies for the selected regional towns. Flooding can carry a wide range of pollutants into the drinking water supply, which can then reduce the effectiveness of the water treatment plant.

2.4 Absence of a Skilled Workforce

A key reason for non-compliance is the absence of the necessary skills, experience and knowledge in water in many regional communities.

Both water supply managers and operators have a critical role in achieving Australian Drinking Water Guidelines compliance. Inadequate systems and investment to ensure sufficient knowledge, skills and training in regional areas at the managerial and operations levels, result in a poor understanding of the scope of the Australian Drinking Water Guidelines, how they should be implemented, and why implementation is important. The potential consequences of compliance breaches are not fully appreciated and the role of the operator in actively managing water quality is poorly understood. This leads to inadequate operation, maintenance and documentation practices that contribute to poor water quality.

Treatment plant operators working in regional areas do not receive access to the same level of training provided in the larger metropolitan areas. This is significant due to the link between the knowledge and experience of operation and maintenance staff and the safety of drinking water delivered to consumers.

The Commonwealth Government has acknowledged the significance of Australia's water skills shortage following a national audit of labour and skills in the industry in 2008. Consequently, COAG committed to a National Water Skills Strategy, which aims to improve retention and training, particularly in regional and remote Australia. The Commonwealth Government has agreed to provide up to $1.1 million in support of the Strategy, however, the program is likely to be ineffective without the institutional reform required to create organisations with the scale to ensure application and maintenance of those skills.

2.4.1 Supporting Evidence

Regardless of the level of treatment that is in place for a particular town, poor management, operation and maintenance processes can seriously compromise the effectiveness of any treatment system. The management of water systems, along with their operation and maintenance, are key limiting factors in the provision of safe drinking water.

Based on anecdotal accounts from water industry professionals, a number of significant scenarios have been witnessed firsthand. These include the following:

- Staff retention issues – a trained water treatment plant operator who had decided to work at the local bottle shop due to lack of remuneration; Councils preventing staff from completing the final subjects in water treatment certification for fear of them being "poached" by mining operations once certified.
- Inadequate skills – water treatment plant operators who are unable to calculate a dose rate; jar testing equipment for use in the calculation of chemical dose rates that was locked in a cupboard and had never been used; water treatment process equipment that had been disabled.
- Repeated and widespread instances of filter failure – causing inadequate filtration, clogging of filter nozzles, mixing of filtered and unfiltered water and structural damage
- Treated water storage issues - poor management and maintenance of treated water reservoirs - and Appendix K), which is also supported by Magill and Barry (2009); prolonged storage of treated water (due to supply not matching demand or oversized reservoirs), leading to poor chlorine residual/disinfection.
- Poor implementation practices - risk management plans (such as Hazard Analysis and Critical Control Points, or HACCP) are prepared, but trigger levels in the plant do not match those in the risk management plan.
- Failures in auditing processes – audits that are a quick documentation check, rather than auditing the implementation of plans and procedures.

- Failure in governance - The data collection period revealed some failures in governance to provide safe and reliable drinking water systems. For example, one Council – who was also the water utility – was fined in the Land and Environment Court for breaches of their Environment Protection Licence conditions, due to non-compliant operation and maintenance of their water treatment plant. Another Council was fined for failing to prevent and manage a sewer overflow into the drinking water supply.

The most concerning factor is that these scenarios are common across Australia, not just limited to regional towns, with some also observed in major cities.

2.5 Inadequate Operator Training

Improving training and wider compliance with ADWG could deliver significant benefits.

Better skilled operators will be more capable of facilitating and enhancing compliance with Australian Drinking Water Guidelines. Improved compliance with the Guidelines will increase the quality of water supplied to the consumer and generate a range of socio-economic benefits.

Reducing water-related illness in the community will increase workforce productivity due to fewer sick days. Fewer outbreaks of illness will also contribute to lowering healthcare costs. Ad hoc and reactionary planning and funding will decrease, resulting in significant cost savings.

Improved training will also help raise the status and recognition of water system operators. Recruitment and retention of skilled staff in regional areas are also likely to be facilitated, as water operations becomes an identifiable career path.

2.5.1 Supporting Evidence

Hellard et. al. (2003) completed a large community-based study (involving 2,811 community members) on the economic impact of gastroenteritis in Australia. The cost of items such as a doctor, medical specialist, hospital care, faecal specimen test, medication, time costs for the individual or time off work to care for a family member were quantified. The total annual cost to the Australian community was estimated to be around $343 million.

Operator training is poorly delivered and inadequately utilised in regional towns. Numerous stakeholders engaged during this Review identified current operator training practices as an inhibitor to the delivery of safe drinking water. Examples of some of the issues identified through the workshops and discussions with stakeholders include:

- Water treatment operations is not seen as a career path and attrition is high
- Some utilities are reluctant to train operations staff as they are concerned they will be lured elsewhere
- There is a lack of continuing development to foster career progression and pride in career
- There are numerous instances of underqualified training personnel with little actual experience in operating a water treatment plant
- There are accounts of operators receiving Certificate III Level qualifications through the Recognition of Prior Learning or Recognition of Current Competence process after answering some relatively simple questions
- Training and testing criteria are often generic and not specifically tailored for individual operations
- Operators may attain a Certificate level accreditation without combining an appropriate group of units, e.g. a Water Treatment Plant operator can gain a Certificate III without completing units on filtration or disinfection
- Employers often believe that attaining a Level III certification means that no more training is required
- There is poor auditing of training to ensure an operator uses and retains knowledge gained through training.

In December 2009, the National Water Commission announced at least $1.1 million in funding under the National Water Skills Strategy (NWC 2009c). This strategy was developed with COAG and reflects the importance of addressing operator training. Programs, such as the H2Oz employment program and the Water Industry Skills Taskforce have emerged to improve exposure to water careers and to improve water industry training.

Water industry professionals provided reports of water utilities that had experienced “poaching” of trained water treatment plant operators by mining and other companies. As a result, some water utilities are hesitant to up-skill operations staff in the event they leave as a result of their training.

However, it is crucial that water operations be seen as a career by both water utilities and the operators of the drinking water treatment plants. Water treatment plant operators protect public health and should have the skills to ensure this role can be fulfilled. Given the current evidence this is clearly not the case.

The North Pine fluoride overdosing incident that was reported in April 2009 (see Box 10) is an example of a risk to public health that arose due to operator error.

Box 10: North Pine Incident, Qld

During April 2009, it was reported that a series of events lead to over-dosing of fluoride at the North Pine water treatment plant in Queensland.

The Queensland Health report (2009) cited inappropriate operational responses, lack of understanding and lack of reporting on the operator's behalf as contributing factors to the event.

(See Case Study 7, Appendix K for more information)

Figure 7 Algae growth – risk of cyanotoxin production; uneven filter backwash
Figure 8 Algae growth – risk of cyanotoxin production
Figure 9 Failed filter media – material should not be present in the plenum
Figure 10 Failed plenum grouting – allows filter media and raw water to move into treated water stream

Risebro et. al. (2007) carried out a study into 61 water borne disease events, which show that for contamination events directly attributable to treatment failures, 90% were due to filter failure.

Figure 11 Failure of filter media – stratification of gravel, sand and anthracite has failed
Figure 12 Mud on filters – backwashing is failing; filters not functioning
Figure 13 Failure of filter media – gravel, sand and coal mixed together; backwash scour too high, failure of filtration process, nozzle damage
Figure 14 Uneven backwash; media carry over in the backwash troughs
Figure 15 Filter breakthrough; anthracite visible on the sand; nozzle patterns showing inflow too high
Figure 16 Muddy filter and algae growth – very poor treatment effectiveness

Note: all of these photos were taken at regional Australian water treatment plants.

Figure 17 Poor security – graffiti on a treated water reservoir; inset – paint cans that were disposed of in the reservoir through an open/unsecure roof hatch

Figure 18 Reservoir access ladder stiles protruding from an unsealed entry hatch area – poor seal, poor protection from contamination

Figure 19 Reservoir roof drain misaligned with overflow pipe – leaf litter, bird droppings etc flowing into treated water reservoir

Figure 20 Reservoir ventilation mesh not effective against leaf debris and wind borne contamination

Figure 21 An Asbestos Cement overflow riser pipe that is de-laminating in the treated water reservoir

Box 11: Water Treatment Plant Operation and Maintenance, Vic

An independent water quality specialist provided a concerning "on the ground" account of failures in the operation, maintenance and auditing of a water treatment plant in Victoria. The specialist was on site when an auditor visited to investigate the water treatment plant's compliance with the Victorian Safe Drinking Water Act. The audit comprised of a 'document check' and was completed (and passed) in 15 minutes. The specialist noted many non-compliances that were completely missed in the auditing process:

- The valve on the raw water bypass was rusted shut; the operators said it was closed, but there was no way of checking whether that was the case and therefore whether raw water was leaking into the finished water supply.
- The filters at the plant were in the worst condition the specialist had experienced.
- The plant has a HACCP plan, but the trigger limits stated in the plan are not adequate for the protection of human health (particularly the turbidity limits).
- The trigger limits in the HACCP plan did not match those in the SCADA system; the SCADA system contained less stringent limits.
- The plant operators tested the turbidity meter by putting a handful of dirt in the water near the meter; the alarm eventually went off, but the plant did not shut down; if the dirt contained cryptosporidium, it would have contaminated the water supply and may have been fatal.

Achieving water security in regional areas is a relatively more complex task than in major urban areas because, unlike in Australia's cities, towns in regional Australia often share the same water source and this resource may be utilised by a number of water utilities.

Regional communities often share water resources with large water consumers such as irrigators, whereas most metropolitan utilities enjoy comparatively less competition for supply. Regional communities also usually share the main water source with other towns.

Sharing the same resource means that decisions made by regional utilities involve far reaching impacts, across the catchment and water system as a whole. Delivering certainty of supply, and hence water security, across a catchment therefore requires a high degree of coordination between all water users; currently this does not happen consistently. Where multiple users operate within a catchment, urban reuse schemes can have unintended consequences, with negative outcomes for downstream customers and environmental flows, as treated effluent is no longer returned to the river.

For the majority of regional water utilities their options for diversifying raw water supply sources are limited by their geographic location. The majority of regional utilities are rainfall dependent and operate within regulated systems, governed by complex water sharing arrangements. Inland utilities cannot feasibly rely on desalination of sea water as a diversification option, while treatment of brackish groundwater results in difficult brine disposal issues. Establishing physical linkages between discrete supply systems is often not feasible due to remoteness.

The Commonwealth has recognised these challenges and in response committed $254.8 million under the National Water Security Plan for Cities and Towns to fund projects that save water and reduce water losses in locations with population less than 50,000. A further $200 million has been committed under the Strengthening Basin Communities Program, which will assist communities in the Murray-Darling Basin to understand and adapt to a future with less water

2.5.2 Supporting Evidence

Water availability in Australia is characterised by its scarcity, and temporal and spatial variability. However, Australia's water security problems cannot be attributed to scarcity alone. On a per capita basis, Australia is one of the most water abundant nations, meaning that the challenge is to manage water resources given the variance between where and when it rains and where and when water is required (Productivity Commission 2008).

To assess the water security issues experienced by the selected regional towns, information on rainfall and drought, proximity to the coast, average annual rainfall, water restrictions, per capita water consumption and pricing was sourced. A selection of the evidence gathered to demonstrate the complexities associated with delivering a secure water supply to regional towns in the following sections.

2.5.2.1 Rainfall and Drought

The volume and frequency of rainfall and the runoff produced by that rainfall is the major limiting factor in the level of water security experienced by regional towns and other communities across Australia.

Based on Figure 7, it is clear that a large proportion of Australia has received below average rainfall over the past three years, while three quarters of the towns selected for investigation during this Review were experiencing drought (Figure 8). The rainfall anomalies experienced in recent years (see Appendix N) indicate that Australia's rainfall has also become less predictable, which will present a significant ongoing challenge.

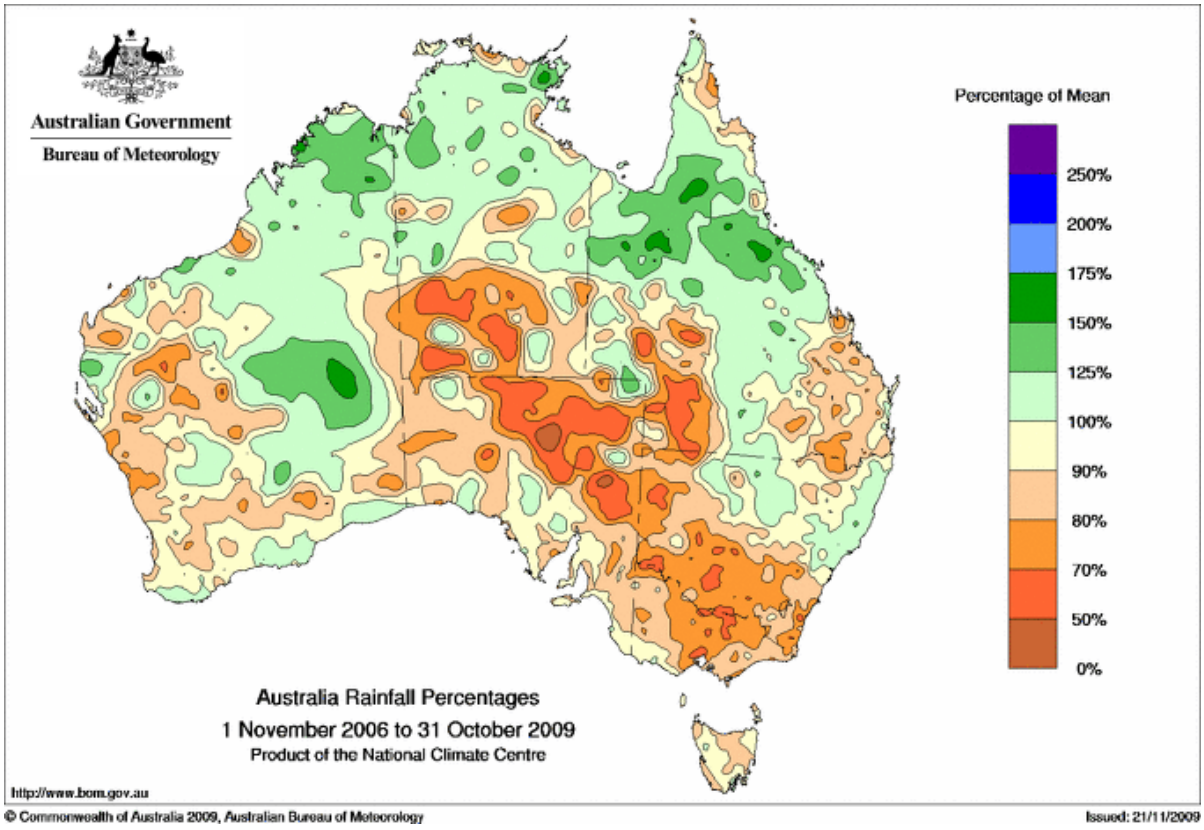


Figure 7 Risk to water security in regional areas – orange areas represent below average rainfall (BoM 2009)

This has placed significant pressure on national and State based water management organisations to balance the supply of water to various sectors and the environment. In the eastern part of Australia a significant proportion of regional towns draw water from major regulated rivers that are also subject to interstate agreements, so the distribution of flows is a political issue. For towns utilising bore water supplies, salination and reduced yields are potentially the most significant threats.

The successful management of drought is a key factor for many regional centres to ensure a viable future. However, the information collected suggests that drought management plans are rare amongst the smaller water utilities. A contributing factor is the lack of expertise that exists within some of these utilities; personnel do not recognise the imperative to develop such a plan, or have the skills or experience to procure a consultant to do so on their behalf.

Drought management plans can also be a costly exercise, depending on their quality and complexity. A significant limiting factor can be the lack of information that is available regarding the supply systems in some regional towns. Often it is poor and incomplete, meaning that accurate supply and demand forecasting cannot be undertaken.

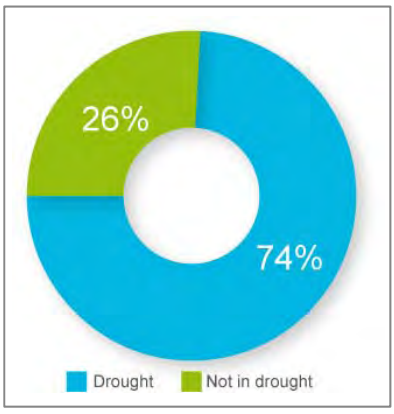


Figure 8 Percentage of selected towns experiencing drought

Some well known illustrations of some potential consequences of below average rainfall and drought conditions for regional towns include:

- Extreme water shortages leading to trucking water into towns.
- Major projects are being prioritised, including stormwater recycling projects infrastructure projects, such as dam augmentations.
- In a number of locations, water grids have either been established or investigated to reduce dependence on less reliable surface water supplies.

2.5.2.2 Other Water Security Risk Factors

Some further risks to water security for the selected regional towns are presented in Table 9. The most widespread risks are described below. A complete summary of risk factors for the selected towns is provided in Appendix N.

- Single drinking water source – 66 of the 101 selected towns have only one drinking water source, with no backup when that source is affected by water quality or security issues.
- Irrigation – 45 of the 101 towns have nearby irrigation industries. While water allocations generally go to the community before agriculture, the evaporative and infiltration losses involved with the irrigation trenches are sometimes considered to be a deduction from the total water allocation, and therefore the potential potable water supply. It is recognised that Water for the Future programs (such as the Private Irrigation Infrastructure Operators Program in NSW) are addressing this in some areas.)
- Flooding – This is an issue for 35 of the selected towns. Flooding affects water quality when pollutants are washed into the drinking supply, which in turn affects water security if the town only has one supply source and basic treatment.
- Unsustainable water extraction – 30 of the selected towns are reported to have unsustainable water extraction.
- Seasonal population loadings – A number of the towns in the investigation have highly seasonal tourism. This can be difficult to manage if water supply volumes are low or if water infrastructure is inadequate for the permanent town population.
- Rapid population growth – Some of the selected towns are experiencing rapid population growth, which can place pressure on water systems that are already under stress.
- Trucking water – Trucking water in areas with extreme water security issues also puts pressure on the neighbouring town that is supplying the water.
- Proximity to the coast – Many of the selected regional towns are located a considerable distance from the coast, which usually makes seawater desalination an unviable option due to the cost of pumping.
- Inland desalination – where inland briny waters do exist, use of this water is challenging due to brine disposal issues, especially as lagoon evaporation is becoming less acceptable. Additionally, the relative cost of reverse osmosis is currently higher than that of conventional treatment, particularly for smaller throughputs.

Table 9 Water security risk factors unique to the selected regional towns

Risk	% of Selected Towns With Water Security Risk Factor
Single drinking water source	66
Irrigation	45
Flooding	35
Unsustainable water extraction	30
Seasonal population loadings	26
Rapid population growth	25

2.6 Poor Catchment-Based Planning

Many planning and regulatory frameworks for the water sector are focussed at a catchment level, which typically is not the case for water utility planning, particularly in NSW and QLD.

It has long been recognised that the management of Australia's water resources according to institutional boundaries (such as State borders) has been a key barrier to achieving sustainable outcomes. Indeed, the Murray Darling Basin Plan is designed to remove this impediment.

The fact that urban water planning in parts of regional Australia continues to be defined by local government boundaries stands out as an oddity in Australia's water resource management framework. It contrasts with the approach in NSW, for example, where catchment-based water sharing plans provide a rational approach to sharing the water resource between users and the environment and, for users, between town supply, rural domestic supply, stock watering, industry and irrigation. This approach indicates that more sustainable models can be implemented.

The consequences from this regulatory framework are best illustrated through the example of water restriction regimes. The definition and application of water restrictions is governed by the water utility and is therefore applied on a supply system basis. This means that water restriction definitions and triggers are often not applied consistently within a catchment, though the water is being abstracted from the same resource.

In NSW, the regulator reserves the right to overrule water restriction decisions made by water utilities to protect the overall security of the water resource. This is irrespective of the plans that utilities have developed to inform such decisions. Thus the actions of these small utilities in delivering water security are often rendered ineffective.

2.6.1 Supporting Evidence

Traditionally, most states have encouraged "catchment to tap" management systems and plans. However, in an era of drought and increased reliance on manufactured water supplies such as recycled water and desalination, a "catchment to coast" approach that follows water from the source to the coast and considers the full range of users would be more suitable.

Catchment based planning improves management of water supplies in a number of ways, including:

- Water resource planning encapsulates upstream and downstream users.
- Drinking water demand management is considered at a broader level, incorporating users up and down stream when developing a long term supply-demand balance. It would consider all the water resources applicable to that region including rivers, dams, groundwater, stormwater, recycled water and stormwater.
- Consideration is given to the requirements of industry and agriculture and their impacts on the quality and quantity of source water supplies.
- Drought management and response considers those users in the same catchment and how the actions of one town may positively or negatively impact adjacent users, improving management of available supplies.
- Impacts of waste streams on the quality of downstream drinking water sources are considered, managed and prevented.
- More rigorous and detailed modelling of the drinking water supply system incorporates a broader set of information.
- Environmental impacts of water supply operations are prevented or better managed.

The increased uptake of water recycling and reuse has demonstrated the adverse impacts of not planning on a catchment wide basis. As more river towns reuse their waste streams and keep the water within their local community, less water is delivered back to the river systems for downstream users.

Inadequate or poorly understood water resource planning in regional towns can lead to conflict between the major water consumers on a local supply system. This can become a particularly emotional issue when a major allocation is assigned to an industry such as mining or power generation and the local community is on water restrictions.

Victoria currently employs a "catchment to coast" model for water planning, while regional approaches to drought proofing are currently being implemented across some parts of NSW via alliances and Regional Organisation of Councils. This approach also provides better access to technical expertise and economies of scale in procurement.

2.7 Inadequate and Inconsistent Planning Frameworks

Significant benefits could be achieved by aligning water business reporting, planning and management is across regional Australia.

Water business related planning is not performed well in regional areas compared with the planning undertaken for metropolitan utilities and larger regional centres. Planning practices also differ between States, and as a result, the management of factors such as drought, demand, water quality, climate change and capital infrastructure is not achieved in a consistent manner and more importantly, not performed adequately in some parts of the country.

A direct outcome of this is that performance reports and forward planning documents are structured differently and different statistical performance measures are used. Consequently, it is very difficult to compare the effectiveness of water utilities across the nation, to develop an accurate picture of the current situation or to assess preparedness for the future.

A standard national approach would streamline performance statistics and assist governments in evaluating the need for supplemental funding. It would foster competition between the utilities which should generate more rapid progress towards the objectives of the National Water Initiative. Regulation and monitoring will be a simpler and more efficient process.

2.7.1 Supporting Evidence

Accountability to both regulators and customers is especially lacking in regional towns. Most States do require some form of regulatory reporting, however, the Commonwealth only reports on utilities with greater than 10,000 connections (included in the NPR). Inconsistency in reporting is evidenced by the unavailability of performance data for some water utilities during this review. The Queensland government does not as yet have much information available on water utility performance, though mandatory reporting is now being phased in. Other States, such as NSW, demonstrate a higher level of transparency through their own public reporting.

Of particular concern is that both the States and the Commonwealth have a focus on reporting of historical information, with a distinct lack of reporting on projected future demand, infrastructure, pricing requirements and climate change.

Australian Academy of Technological Sciences and Engineering (ATSE 2007) found that in some parts of Australia, institutional support and technical rigour for water supply planning are largely absent with respect to non-metropolitan urban water utilities. That is, the regulatory drivers and guidance, as well as an understanding of the essential components that comprise water supply planning were both missing.

It is not uncommon for water utility planning reports to utilise differing assumptions; for example, secure yield investigations that use incorrect or outdated demand projections. This means that the yield established to ensure secure water supply may be underestimated if the demands have been underestimated, yet this planning informs infrastructure planning and investment. The States also provide varied levels of guidance to utilities on how to develop robust management plans.

ATSE 2007 also found that financial incentives for completion of planning were less effective than regulation, with Victoria demonstrating the most advanced planning processes as a result of their regulatory framework.

An improved and consistent planning framework would allow State governments to accurately determine which utilities are achieving adequate planning for future water supply and would allow for informed decisions associated with future funding programs. It would also generate competition amongst the States, which should improve uptake of the planning framework.

Data to support the inconsistency in water security planning and water restriction definitions, water consumption and asset management is provided below.

2.7.1.1 Water Security Planning and Water Restrictions

The general lack of planning for water security has meant that shortages have been addressed through extended and strict water restrictions in many towns. However it is difficult to compare severity across towns as most restrictions are framed in terms of prohibited usage rather than consumption per person – the latter being difficult to enforce with the presently limited metering.

Water restrictions are implemented when the availability of a supply decreases and the presence of water restrictions is often used as an indicator of water security. Of the selected towns, 69% were under some form of water restrictions, with Level 3 water restrictions the most common (Figure 9). However, the rules associated with the restrictions for each town differ as there is no national standard to describe what constitutes a particular level of restriction. This makes it difficult to quickly determine what towns are experiencing the most or least stringent restrictions.

Implementation of consistent targets and water restriction definitions would improve understanding of where in Australia water security is of particular concern. NSW DECCW encourages the use of the "5/10/10 Rule" for water security planning, which takes into account the duration, frequency and severity of water restrictions; while other States and individual utilities rely on other sets of assumptions.

Box 12: The 5/10/10 Rule

- Duration of restriction does not exceed 5% of the time
- Frequency of the restriction does not exceed 1 year in 10 (i.e. 10% of years)
- Severity of restriction is such that supply should only need to be reduced by 10% during a repetition of the worst recorded drought

Source: Samra 2009

Figure 9 Water restrictions for the selected regional towns (2009)

2.7.1.2 Water Consumption

There is no nationally consistent measurement or reporting of usage per person. Additionally, while the NPR gathers historical usage but does not report on forecast usage.

Water consumption was found to be poorly reported for some States. This is partly due to the lack of accurate information that is available. Often the supply statistics are given as a bulk treated volume (and therefore not separated into discrete consumption sectors), or the average volume supplied to households.

The AWA states that the average per capita water consumption is 285 L/day (AWA 2007). Of the selected towns, 41% of those reporting per capita usage were above the average. There are some large outlying per capita water consumption statistics of up to 2,000 L/day. It is not clear from the available information whether this is an average based on the total water supply produced or whether these towns have abnormally high water consumption. This illustrates the inconsistency in data capture and disclosure for some regional towns.

The contributing factors in the variability of the water consumption statistics are information accuracy, community awareness and education, water restrictions, frequency and reliability of rainfall, climate, current availability of supply, historical water security, domestic water applications, use of decentralised systems such as rainwater tanks, as well as the loss of water from the system through mains breaks and leakages. Without adequate management and planning processes, these contributing factors cannot be well understood.

2.7.1.3 Water Metering

Fundamentally, there are still a number of towns that are without domestic water metering, which is essential to develop accurate and reliable plans to ensure future water supply requirements can be met. Metering is important as a tool to enable demand management, measure efficiency of supply and consumption, and importantly, to ensure customers are aware of the volume of water they are using.

Lis (2006) reported a 10% decrease in water consumption following installation of water meters in the UK. Similarly, in Hamburg, Germany, water consumption by domestic users is 18% lower in metered apartments than in unmetered apartments (Trinkwasserversorgung in Deutschland, 1993).

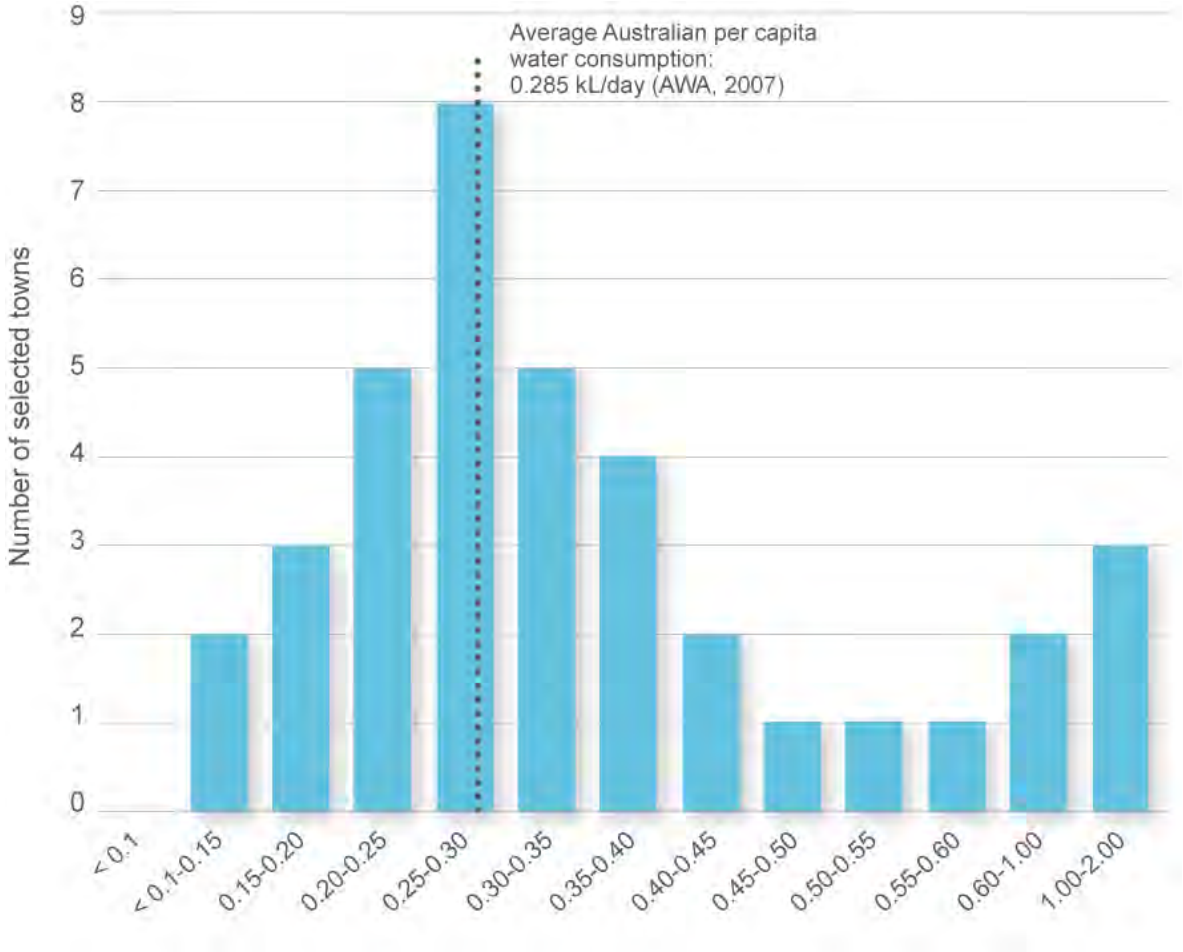


Figure 10 Average daily water consumption for the selected regional towns and the national average (2009)

2.7.1.4 Asset Management and Water Losses

Poor management of assets in the network contributes to missed efficiency gains. Water is wasted when water utilities are unable to identify and prevent water losses in the distribution system as a result of main breaks and cracks. Water losses increase the level of water security stress on a community by further reducing the amount of water available.

These losses may be caused by aging infrastructure and inadequate operating pressures, and not only increase operating costs, but also the carbon emissions generated by that utility. This problem will continue to worsen, as climate change leads to drier conditions, which will affect the integrity of water infrastructure. Asset management plans should to take these effects into account.

As a result of the recognised economic difficultly water utilities have had in maintaining water assets, the Water Loss Management Program was established. It is a $22M joint initiative of the Local Government and Shires Associations (LGSA) of NSW, the Water Directorate and the Commonwealth Government (through the Water Smart Australia program). As of June 2010 there were 66 water utilities participating in the program, who will receive specialist knowledge and equipment to help identify, develop and implement water saving projects for their drinking water distribution systems. Initiatives such as this will help the smaller regional towns to operate a more efficient supply system (Werner, Maggs and Petkovic, 2009).

2.8 Governance Arrangements

If water governance arrangements for water utilities in NSW and Queensland were on a catchment basis, as is the case in Victoria, significant benefits could be achieved.

Under a model similar to that in Victoria, water quality and security planning could be implemented more efficiently and, as noted in Section 2.6, would be consistent with existing catchment based resource management plans. These outcomes would be achieved because:

- Larger, regionally significant utilities would be more likely to attract highly skilled water staff, financial and asset management planners
- A relatively larger customer base allows utilities to fund capital works with a relatively smaller impact on residential water bills, addressing a key equity concern with full cost recovery by small water utilities
- Utilities would be large enough to justify oversight by existing independent pricing regulators, delivering transparency in decision making and greater economic efficiency

Action is required now to address the institutional barriers to smaller water utilities delivering healthy water quality and water security, as the costs of inaction will only continue to grow.

2.8.1 Supporting Evidence

Delivery of water supply is becoming increasingly complex and costly, and the advantages offered by larger service providers are becoming more widely recognised and embraced. ATSE 2007 identified that the institutional model adopted has a direct impact on the extent and quality of water supply planning undertaken.

ATSE (2007) also questioned the capacity of local government owned water utilities to meet future challenges due to the increasing complexity of water management in Australia and the difficulty in sourcing specialised skills. A direct comparison between Victoria and NSW demonstrated that the smaller utilities in NSW were slower to commence urban water planning even with the support of the state government. Similarly, Byrnes et al. (2009) found that Victorian water utilities were managed relatively more efficiently than comparable NSW utilities.

Some of the many advantages that can be derived through governance reform have included:

- Significant scale economies in service provision, that come from sharing of resources and knowledge
- Capacity to attract good quality staff increases
- Ability to pay for new capital projects and renewals improves through greater customer base
- Adaptability to new complexities arising in water quality management
- ‘Catchment to coast’ based planning is made simpler
- Less dependency on government funding in the long term
- Potential to implement better and fairer pricing models.

Armstrong and Gellatly’s (2008) independent inquiry into water supply and sewerage services for non-metropolitan NSW identified two clear trends, compliance with both the Australian Drinking Water Guidelines and the NSW Best Practice Management Guidelines for Water Supply and Sewerage decreases as the number of connections served by a water utility decreases (see Figure 11).

By comparing quality of services with cost and highlighting the economies of scale that may be provided, WSAA (2008) provide further justification for consolidation of smaller utilities (see Figure 12). Non-capital city economically regulated utilities tend to be relatively low cost but have mixed service levels, while council run utilities tend to be high cost with moderate service levels.

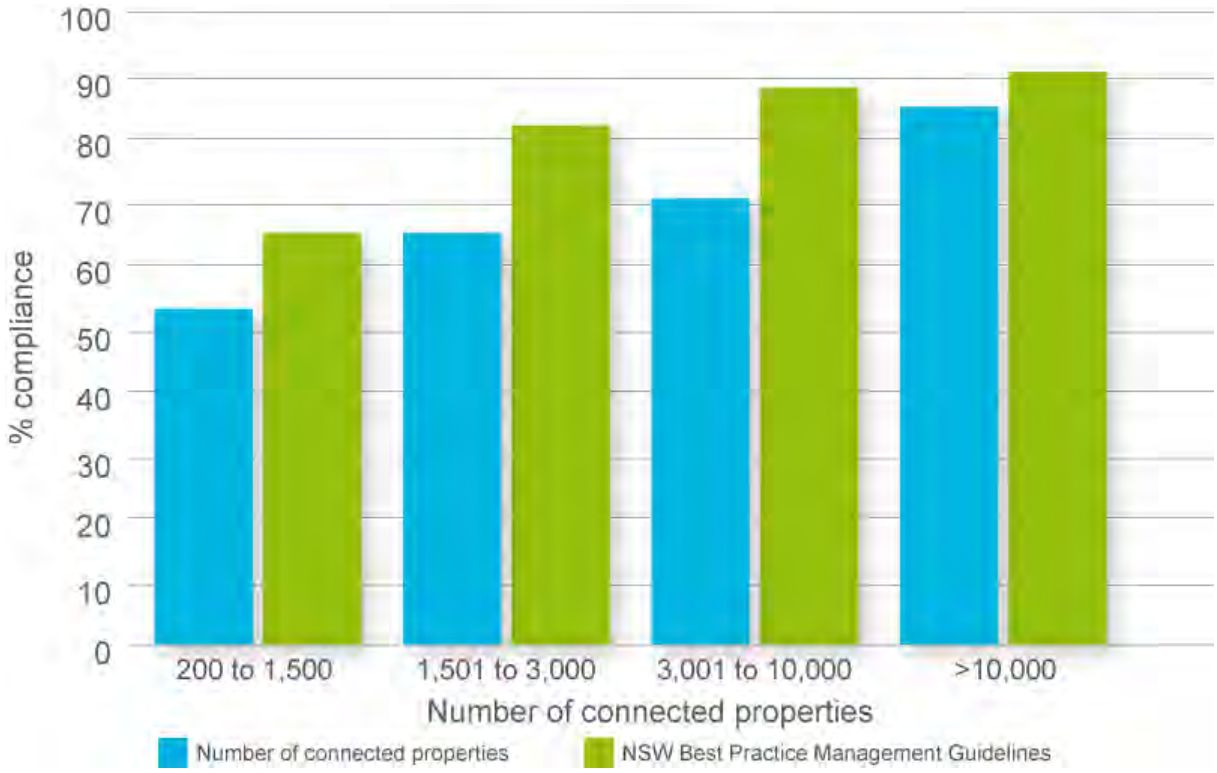


Figure 11 **Compliance of NSW Water Utilities with ADWG (2004) and the NSW Best Practice Management Guidelines for Water and Sewage (Armstrong and Gellatly 2008)**

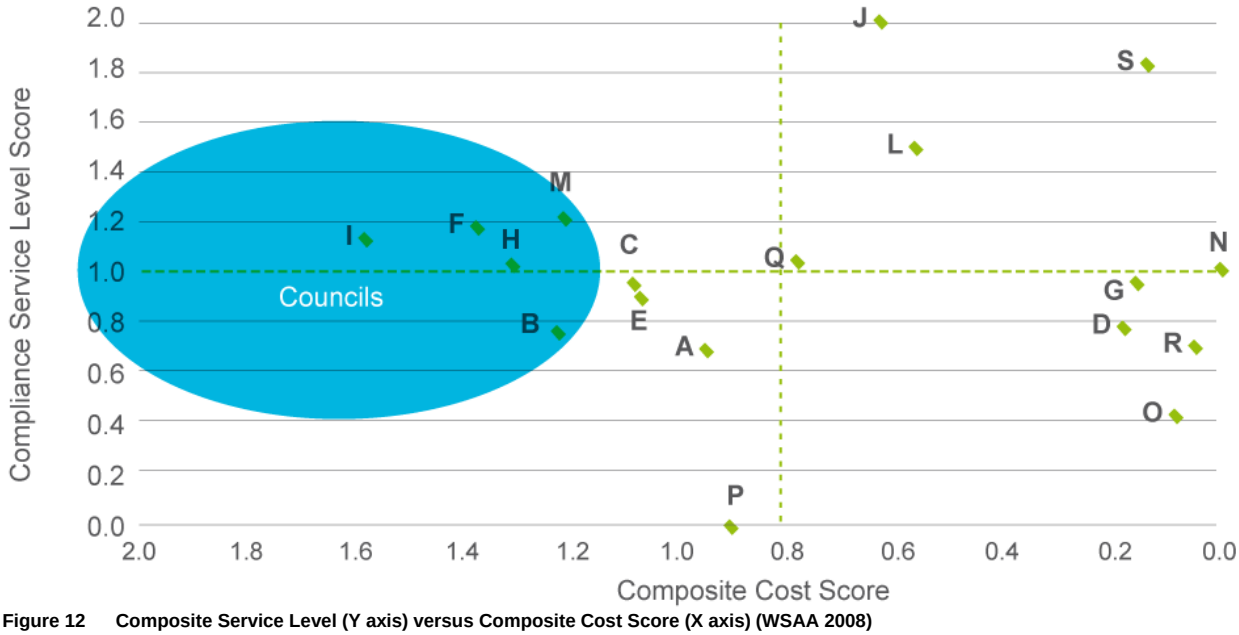


Figure 12 **Composite Service Level (Y axis) versus Composite Cost Score (X axis) (WSAA 2008)**

Further, historical data shows that larger water utilities service their regional communities at relatively lower cost, with the annual water bill in Victoria being approximately 20% cheaper than the annual bill in regional NSW (NSW DWE 2009) and nearly 30% cheaper than in country Queensland.

The regulatory regime in place in each State can influence the effectiveness of a water utility, including their ability to plan for water security. Most States in Australia have undertaken, or are presently undertaking industry reform. The regulatory regime in place for non-metropolitan NSW in particular includes limited direct control over the activities, policies and pricing of local water utilities (Armstrong and Gellatly 2008). This may be a risk factor for the development of water security in regional areas.

Victoria

The delivery of water and wastewater services to urban communities across regional Victoria for household, commercial and industrial use is the responsibility of Regional Water Corporations (RWC), that have no connection with local government. However, this has not always been the case. The Victorian water industry experienced substantial reform during the early 1990s following the election of the Kennett government. In parallel with a series of council amalgamations, around 400 local government (non-metropolitan) utilities were consolidated into 15[8] regional utilities (World Bank, 2004).

Each RUWC is responsible for a well defined district. The powers of a RWC are established via the Water Act 1989.

In contrast to the NSW and Queensland model, the management of RWCs is not the responsibility of a directly elected council. The relevant state minister appoints the Board of each RWC and that Board reports to the Minister through, *inter alia,* an annual report. Governance is by way of a Water Service Agreement made between the minister responsible for water and each RWC. These agreements contain the government's expectations of each authority and the obligations of the RWC to the various customers it serves.

In Victoria, the Essential Services Commission (ESC) is the economic regulator of all water and wastewater utilities in the state, including RWCs. This contrasts with the situation in NSW, where economic regulation is a function of a government department rather than an independent tribunal. The ESC undertakes pricing reviews in order to determine a 'reasonable' tariff structure for each RWC to apply. Matters considered by the ESC include infrastructure renewal expense and relative water demand. RWCs are also monitored with respect to the various service obligations embedded within their operating licence.

A recent academic study (see Byrnes et al. 2009) found that water utilities in Victoria were 13% more efficient when compared to utilities in NSW of a similar size. The authors argued that this was largely due to the governance arrangements in place in Victoria since the 1990s, which were thought to permit a greater degree of professional managerial competence, largely due to the ability to attract skilled managers to larger water corporations.

Tasmania

In 2008, the Tasmanian Government passed the Water and Sewerage Industry Act and the Water and Sewerage Corporations Act, removing the responsibility for water and sewerage services from the 12 Local Councils and transferring it to three new regionally based Corporations, supported by a common entity named Onstream. Though the corporations are independently run, they are owned by the local councils in each region.

This reform occurred to ensure the long term sustainability of water supply in Tasmania, incorporating the social, health and environmental issues in each community. It is foreseen that these new businesses will have the financial strength to raise the capital required to implement infrastructure needed to improve water quality and security in the state (LGAT 2009). It is too early to comment on any success that this model will demonstrate, but the positive impacts on the very poor water quality experienced in Tasmania in the past are expected to be large.

Queensland

Queensland has consolidated a large number of council owned water utilities in the past two years. The newly formed Seqwater came about after the Queensland State Government took over control of the water supply systems in South East Queensland and amalgamated the regional council responsibilities. Granzien (2009) reports that ongoing adjustment is already giving way to rapid change. Those changes are described in Box 13.

[8] Two urban rural water authorities provide combined water, sewerage, irrigation and domestic and stock services; Grampians Wimmera Mallee Water and Lower Murray Urban and Rural Water.

Box 13: Seqwater Amalgamation Improvements Recognised

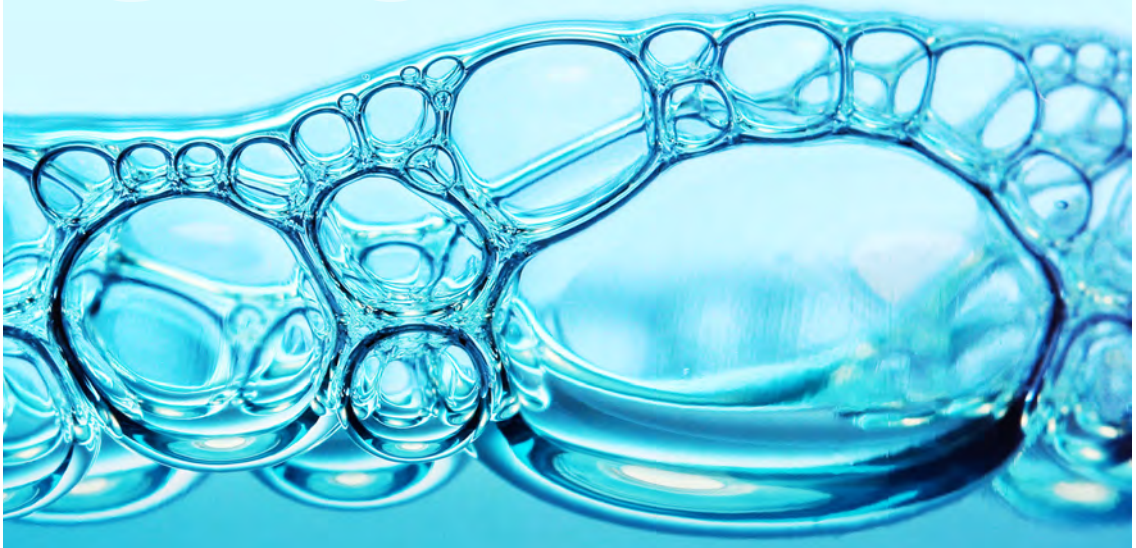
- Gaps in treatment capabilities identified
- Improved transparency requirements and accountability enforced
- Re-training of staff to ensure competencies align with delivery requirements
- Production of water that is not only safe, but aesthetically pleasing
- Introduction of new treatment technologies (desalination and ultrafiltration)
- A water grid to improve water security and efficiency
- Catchment to coast approach for more sustainable water planning

Source: Granzien 2009

AECOM

Recommendations

3.0



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3.0 Recommendations

As our key findings suggest, this review found that in terms of water quality, there is an Australia-wide need for improvement, while the institutional barriers to delivering water security are largely confined to NSW and Queensland. Reform of governance arrangements in NSW and Queensland is a crucial first step to implementation of a number of the recommendations outlined below. In particular, cost reflective pricing is unlikely to be feasible unless 'postage stamp' pricing can be implemented across generally larger water utilities. Similarly, corporately structured, independently managed and larger water utilities are first required to attract the highly skilled water industry professionals to address the water quality and security challenges facing many of the smaller towns in regional Australia.

3.1 Compliance with the Australian Drinking Water Guidelines

Recommendation 1 – Regulate or Legislate Compliance with the ADWG

States that have not already mandated compliance with all elements of the ADWG via legislation or regulatory instruments such as operating licences should do so. This will provide a clear message to water utilities that public health is a vital component of the service they provide.

The State health departments will continue to be responsible for advising on health-based water quality monitoring and testing requirements for each utility.

Compliance with the ADWG is not feasible in some smaller communities, and as such, exemption applications should be introduced to allow for flexibility in regulation where required. However, where the ADWG will not be met with respect to agreed health-based requirements, utilities will be required to notify consumers so that they may protect their own health.

Recommendation 2 – Establish Independent Review and Reporting of Compliance with the ADWG

Ensuring independent auditing of compliance with the ADWG will require shifting responsibility away from the State water departments.

- State health departments should be responsible for monitoring, testing and reporting on health based parameters.
- Water utilities should be responsible for monitoring and testing non-health based parameters through NATA accredited laboratories, and these results could be reported through either the State health department or the independent regulator.
- The independent regulator in each State should be responsible for audit and public reporting of compliance with the ADWG, excluding monitoring and testing of water quality.

Recommendation 3 – Instigate Appropriate Responses to ADWG Non-Compliant Results

Where compliance mechanisms do exist, the existing arrangements do not sufficiently incentivise compliance. Rather than utilising a penalty or reward system (which can lead to perverse results), it is recommended that repeated non-compliance against health-based parameters within the same supply system should result in an audit of the water utility's implementation of the ADWG.

- As per Recommendation 1, this audit process should be overseen and reported on by the independent regulator in each State.
- A sufficiently robust self-assessment tool and audit instrument should be identified and adopted as an industry wide standard.
- Water utilities should also be required to report water quality and audit results publically on their website.

One-off or sporadic system failures can be accommodated within the Audit response through water utilities applying for exemptions where they can demonstrate the appropriate management procedures were in place and appropriate emergency response procedures were followed.

3.2 Consistent Reporting and a Planning and Management Framework

Recommendation 4 –Improved Reporting Requirements

At present, water utilities with over 10,000 connections are report to the NWC and WSAA for inclusion in the NPR. This recommendation extends this requirement to all water utilities supplying potable, recycled and/or bulk water for urban water use. This will not only ensure consistent collection of data on water utility performance across Australia, but will ensure all water utilities are striving for best practice performance.

Recommendation 5 – Develop Guidelines for Best Practice Planning and Management of Water Supplies

The Best Practice Management Framework is seen as a more adaptive mechanism than overly prescriptive guidelines and will accommodate adequate flexibility to account for geographic variability in water utility operations and capabilities. A national framework, consistent with the agreed COAG Best Practice Planning Principles and the NWI Pricing Principles, has the potential to be a key instrument for enabling further urban water reform. The framework could include the following components:

- Planning processes and assumptions for Integrated Water Management
- Water security planning and water restriction definitions
- Climate change planning
- Drought management
- Demand management
- Emergency response
- Forward planning to allow measurement of forward looking metrics
- Asset management
- Pricing principles
- Consistent reporting requirements for input into the National Performance Reports

The requirements of this Framework should be incorporated into the KPIs reported against in the NPR. The Framework would facilitate more meaningful analysis of the data reported in the NPR, as planning assumptions and definitions would be consistent and well understood.

Recommendation 6 – Develop a Self Assessment and Audit Tool for Planning

Development of a specific tool to assist water utilities to operate within the new Best Practice Management Framework will aid implementation, provide self-assessment and improve compliance. This tool will also enable consistent independent auditing of implementation of Framework implementation.

Recommendation 7 – Regulate or Legislate the Best Practice Planning Framework

The Best Practice Management Framework should be regulated or legislated in each State to ensure consistent implementation. An initial phasing-in period is suggested to allow water utilities to “catch up” on the required planning components of the Framework.

3.3 Improved Water Pricing

Recommendation 8 – Investigate Pricing Structures to Provide Improved Water Pricing

Significantly more work is required to ensure utilities servicing regional communities are operating commercially. Such reform needs to acknowledge equity and political issues that may arise as a result of changes to water prices, but these issues do not preclude such reform from proceeding.

Further investigation into the structures available to achieve more cost reflective pricing water pricing in regional towns should be undertaken. This investigation should take into account both utilities servicing localised areas, as well as larger regionally based utilities servicing a range of communities. State and Territory governments should play a key role this activity, in collaboration with the National Water Commission.

Professor Mike Young, one of Australia's leading water economists, neatly summed up the policy implications of attempts to target both efficiency and equity objectives through the price mechanism:

> "Unfortunately, governments tend to use water pricing regimes to achieve equity, environmental, revenue and economic efficiency objectives simultaneously. This approach violates a golden rule in policy development, 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 et al., 2007)

Professors John Quiggin and Lin Crase (see for example Crase et al., 2009) have each argued that it would be more efficient if the price of water was set to reflect costs of supply, and adverse impacts on vulnerable consumers be addressed through compensating payments via the welfare system. Those eligible for grants would be identified through demographic profiling of the customer base of each water utility.

One approach could be for such a payment to cover the fixed access charge of a typical residential bill while still exposing all water users to the variable element of the bill that reflects the actual amount of water used.

3.4 Develop a More Highly Skilled Workforce

Recommendation 9 – Develop a Nationally Consistent Water Treatment Operator Trade Qualification

Continue to build on the initial progress made under the COAG National Water Skills Strategy to develop a nationally consistent qualification in water treatment and operations (e.g. Cert IV), with progress overseen by the Water Industry Skills Taskforce (WIST). This activity should be supported by consistent training materials.

Recommendation 10 – Improve the Delivery of Water Treatment Plant Operator Training

The national qualification should delivered by approved tertiary training organisations, with improved emphasis placed on the quality of training. This can be achieved via more meaningful and regular review of training delivery, particularly in regional areas.

A review of existing and new trainers should be undertaken to ensure trainers have the appropriate experience. This review should also include a stocktake of training locations, including options in regional areas.

Recommendation 11 – Include New Operator Training Requirements in the ADWG

To ensure human health risks are appropriately managed, the ADWG should be amended to restrict operation and maintenance of water treatment plants and systems to appropriately trade qualified operators. At minimum, the lead operator at each water treatment plant will be required to hold the water treatment plant operator trade qualification.

3.5 Governance Structure in NSW and Queensland

As we argued at the beginning of this chapter, it is recognised that implementation of the above recommendations is unlikely to be achievable in NSW and Queensland without reform of governance structures. In particular, this reform will make it feasible for the majority of urban water authorities to achieve the recommendations associated with improved water pricing, best practice management and reporting.

We have proposed three alternate governance models below, however our preferred model is the formation of Government owned Regional Water Corporations.

Preferred recommendation 12a – Regional Water Corporations

Under this governance model the urban water utility functions currently performed by local government NSW and Queensland would be transferred to Government owned Regional Water Corporations, the responsible boundaries of which would match catchments to the extent practicable. Each Regional Water Corporation would be governed by an independent board, with appointments to that board based on expertise in water utility management. The board would appoint the senior management team of the Water Corporation. The board would report to a relevant Government Minister against a set of conditions set in an operating licence. Compliance with licence conditions would be mandated via relevant legislation.

The larger corporate structure is likely to give rise to increased efficiency. Recent evidence suggests that this was the result of governance reform implemented in Victoria during the 1990s (See Byrnes et al., 2009). Government would remain the sole shareholder of each corporation and Regional Water Corporations would be large enough

to warrant supervision by independent pricing and regulatory authorities in each state, and compliance with licence conditions, including tariff setting, would be formally assessed by those authorities.

There are a number of key advantages from implementing this governance model. First, the Water Corporation Board and management would have unambiguous objectives related to the efficient and effective management of the Water Corporation. In particular, strategic decisions regarding maintenance and capital expenditure would no longer be made by the local council General Managers. Second, the larger size of each Regional Water Corporation is likely to have a better of chance of attracting appropriately qualified professional staff. Third, the larger customer base of each Water Corporation means that the expense of 'lumpy' capital assets required to improve water quality and security in smaller towns can be spread across a larger number of customers, spreading the impact from increases in residential bills. Finally, in time Regional Water Corporations may be able to raise capital on wholesale financial markets in their own right, a funding option that is rarely available to local government in Australia.

There are two Regional Water Corporation ownership models operating in Australia at the moment that could guide decision makers. Victorian Regional Water Corporations are wholly owned by the State Government of Victoria. In Tasmania, recent reform of the urban water sector in that state saw Water Corporations formed that are jointly owned by the councils that fall within the boundary of each Water Corporation.

Alternative Recommendation 12b – Catchment Planning Alliances

If removal of urban water utility functions from councils is not adopted, at the very least water utility planning should be undertaken at a catchment level. There is precedent for this in a number of Alliances between neighbouring councils in NSW.

The regional planning alliance model should include representation from the local water and wastewater utilities, local Catchment Management Authorities and the State's water department (DECCW in NSW, DERM in Queensland) to ensure State Government objectives are appropriately incorporated into local planning processes.

Alternative Recommendation 12c – State-wide Water Utilities

An alternative to the above models is State-wide water utilities, such as those operated in South Australia and Western Australia. Due to the number and complexity of catchments in NSW and Queensland, the State's water supplies would still be required to be managed on a regional basis. Regional issues would also be better managed by local staff living within the supply area, and consumers would also expect a level of local presence.

Due to the significant effort invested in managing large metropolitan water supplies, and the considerable amount of work also required in regional areas to ensure they achieve the water quality and water security objectives outlined in this report, it would be unviable for one entity to manage such a large and diverse scope of work in States the size and population of NSW and Queensland. We recommend this option entail combining all non-metropolitan water utilities, and that metropolitan water utilities be allowed to continue to focus on what they do well, which is servicing densely populated urban communities.

3.6 Practical Solutions to Localised Issues

The review has identified that many regional towns have yet to implement some of the "low hanging fruit" solutions that have been undertaken in metropolitan areas. For example, there are communities without metering, many networks suffer from large water losses, distribution systems are not adequately managed to prevent recontamination events and consumer efficiency measures have not been put in place.

The recommendations provided above will address these issues through broad policy changes, rather than patching individual issues in specific communities. This is a more efficient means of addressing fundamental problems that are repeated across all States and through numerous regional communities.

AECOM

Reform Strategy

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4.0 Reform Strategy

Some of the recommendations outlined in Section 3.0 are not new ideas and parts of the country will be more prepared for the proposed reform than others. Ease of implementation also varies depending on the current arrangements in that State and the appetite of each Government for water reform.

In this section, we outline the potential issues and opportunities surrounding each key recommendation and include some advice on existing instruments through which the reform could be employed and the change agents that should be involved.

While we do not believe that linking utility performance to State funding is a favourable means of achieving reform, Commonwealth Government assistance to the States could be helpful in achieving the objectives. To facilitate reform of the regional urban water sector, the Commonwealth Government could consider entering into funding agreements with the States, whereby successful and efficient implementation of agreed reforms by each State could attract a payment from the Commonwealth, in recognition of the costs of implementing wide-ranging reform.

COAG has agreed to National Partnership Payments (NPP) under the Intergovernmental Agreement on Federal Financial Relations. Such a payment may be used to facilitate or reward nationally significant reforms or to support a specific project.

Though the funding vehicle is different, implementation could be similar to the reform that occurred during the 1990s and 2000s, where each State agreed to implement a range of reforms to various sectors, ranging from reform of governance arrangements for water planning and management, to corporatisation of state-owned electricity and gas utilities. If NPP were used to incentivise and reward reform, COAG would verify that pre-determined milestones and performance benchmarks have been attained before the incentive payment is made.

Where regulation is recommended, implementation should also include a review of the consequences of policy change with respect to the objectives of COAG's Best Practice Regulation guideline.

4.1 Governance Structure in NSW and Queensland

The realisation of governance reform in NSW and Queensland is crucial to the successful implementation of most other recommendations included in this review in these two States. Without these reforms, improvements to water quality and water security will not be fulfilled in NSW and Queensland. Implementation of this recommendation is described in more detail below.

Option a)

If the Regional Water Corporation model is adopted, we propose that this be completed within two years. While our view is that the reforms will deliver substantial benefits in the medium to long term, there are likely to be some short term distributional impacts, particularly for smaller councils. Therefore, transitional assistance is likely to be required.

- As the reform process in Victoria demonstrated, one-off grants were required to enable some of the smallest utilities to upgrade neglected infrastructure. This is also likely to be the case in NSW and Queensland. This represents an ideal case for COAG to implement a National Partnership Agreement.
- Many local government Councils rely on water utility revenue to their fund general purpose functions, and separation would therefore result in a loss of revenue. To offset this, a proportion of the dividend to be paid by the Regional Water Corporations could be transferred to local councils for a pre-defined transition period once certain reform outcomes had been achieved. This would mimic the practice of making performance payments to the States under the National Competition Policy reforms of the 1990s.
- The Regional Water Corporations should be regulated to return dividends to the State Government when they become profitable, with the model adopted being similar to the Victorian model. Alternatively, the Tasmanian model could be adopted with dividends returned to the legacy Local Government.

Option b)

If the regional planning alliance model is adopted it should be completed within one year.

- The regional planning alliance model should include representation from the local water utilities, local Catchment Management Authorities and the State's water department(s).
- Regional planning alliances should be formed as a "mandatory alliance" as per the Lower Macquarie Water Utilities Alliance in NSW.

Option c)

Implementation of a regional NSW water utility option would require significant reform and, as such, the implementation timeframe would be approximately three years. Key aspects include:

- Metropolitan water utilities should remain unaffected by this option and would continue to service their metropolitan communities.
- One-off grants would be required to implement this option and COAG's National Partnership Agreement is potential mechanism to encourage implementation.
- The Council dividend payment as per Option a) could also be applied to this option for a transitional phase, after the water utility becomes profitable.
- The water utility should then be regulated to return dividends to the State Government, as per the Victorian model.

4.2 Consistent Planning and Management Framework

Implementation of a national planning framework can ensure planning is consistent and performed at a catchment level.

Step 1

Include all potable, recycled and bulk water utilities servicing urban areas in the annual National Performance Report. This can be initiated within one year, though some utilities may not be able to report on all KPIs within this timeframe.

Step 2

Develop nationally consistent Best Practice Management Framework for water management and planning within two years.

- Establish a Best Practice Management Framework Taskforce to oversee a stocktake of existing best practice management of water in Australia and overseas and to determine performance gaps.
- Create a detailed framework via which water will be managed consistently across Australia, including water utility planning requirements (including forecasting), pricing, water restriction definitions, audit and performance reporting requirements.
- The framework should incorporate COAG's National Urban Water Planning Principles and the National Water Initiative Pricing Principles

Step 3

Develop a self-assessment and audit tool for the Best Practice Management Framework within one year of the Framework being made publically available.

- A sufficiently robust self-assessment tool and audit instrument should be identified and adopted as an industry wide standard.
- The tool should be administered centrally and accessible to all water utilities.

Step 4

Legislate or regulate the Best Practice Management Framework two years after development of the Guidelines to allow for reform of NSW and Queensland governance arrangements.

- This would include a review of the implications of mandatory compliance with respect to COAG's Best Practice Regulation guideline.

4.3 Improved Water Pricing

NWC should initiate a review of pricing in regional areas, which will inform development of appropriate pricing models for implementation by utilities servicing regional communities. This review can commence within the next 12 months.

4.4 Compliance with the Australian Drinking Water Guidelines

Legislation or regulation of the Australian Drinking Water Guidelines (ADWG) within two years of the Governance reforms in NSW and Qld.

Step 1

Commonwealth Government to initiate a review the implications of mandatory ADWG compliance with respect to COAG's Best Practice Regulation guideline. This can occur within one year.

Step 2

Taking into account the results of the review in Step 1, the States will regulate or legislate compliance with all sections of the ADWG. This policy reform shall also include:

- Monitoring and reporting of health based parameters by the relevant State Health departments
- Monitoring of non-health based parameters by water utilities, with reporting by either Health or the independent State-based audit authority.
- Independent State-based audit authorities are to be responsible for review, audit and reporting of compliance with the ADWG, apart from areas outlined above that will be reported by the State Health department.
- Identify an appropriate and nationally consistent self-assessment and audit tool to be adopted as an industry-wide standard.
- Public reporting of water quality and audit results on each water utility website.

4.5 Develop a More Highly Skilled Workforce

Step 1

Government Skills Australia to develop nationally consistent training qualification for water treatment and operations within two years.

- Water Industry Skills Taskforce (WIST) to lead a stocktake of the current delivery of water industry training across each State to identify gaps and opportunities for improvement.
- Simultaneously the Commonwealth Department of Education, Employment and Workplace Relations (DEEWR) will conduct a review of all existing registered training organisations that currently provide water skills training.
- Utilising the information sourced during the stocktake, the WIST will develop a nationally consistent training qualification, which will be delivered by registered training organisations.
- Government Skills Australia (GSA) to develop a meaningful review process to ensure training standards are being maintained.
- The difficulty in attracting skilled trainers to regional areas is to be considered during development of the training package, including provision for distance training (e.g. online where applicable) and scheduled training in regional areas utilising trainers from around the state.
- The training package, review of trainers and continuous improvement and updating of the package will then be administered by GSA.

Step 2

Within four years, the Australian Drinking Water Guidelines are to be amended to include required trade qualifications for operation and maintenance of water treatment and delivery systems.

4.6 Barriers and Opportunities

Table 10 Implementation Issues for a Nationally Consistent Best Practice Management Framework

Barriers	**All States** - Existing planning frameworks are inconsistent across States, and will require adjustment from all utilities. - Metropolitan water utilities will also be impacted by this change, but to a lesser extent due to their planning generally being more advanced and compatible. - Existing plans would need to be reviewed and updated in accordance with the requirements of the framework. - There may be a requirement for a temporary increase in resources within water departments in each State to assist utilities in complying with the Framework. - There will be an additional reporting burden on NWC and WSAA in preparation of the National Performance Reports (NPR). **Queensland and NSW** - Qld and NSW are required to reform governance structures before this may be successfully implemented. - Regional utilities in NSW and Qld are not currently independently regulated.
Opportunities	**All States** - The planning frameworks implemented in the metropolitan utilities could be drawn upon in developing the Best Practice Management Framework. - Most utilities have in place existing plans and understand the requirements. - Most water utilities already report on planning to the NPR. - It will provide an ideal opportunity to review the KPIs within the NPR. - Catchment Management Authorities would have more involvement in the management of water within their region. - States would gain improved oversight of planning across their State. **NSW** - NSW already has in place a Best Practice Management Guideline. **Victoria** - Victoria already operates in accordance with an excellent management framework.
Agents for Change	NWC, DEWHA, WSAA, independent regulators in each State, State water departments
Existing Instruments	COAG National Planning Principles, NWI Pricing Principles, existing legislation and regulation in each State, operating licences, NPR

Table 11 Implementation Issues for ADWG Compliance

Barriers	**All States** - None of the States have fully implemented the ADWG. - Metropolitan water utilities will also be impacted by this change, but to a lesser extent, as they have generally progressed ADWG compliance further than other water utilities. - There will be an additional reporting burden on NWC and WSAA in preparation of the NPRs. **Queensland** - Qld is required to reform governance structures for this to be successfully implemented. - Current compliance monitoring and testing requirements are poor. - Water quality is currently regulated by DERM, rather than Qld Health. - There will be an increased burden on the Qld Heath department and QCA. **NSW** - NSW is required to reform governance structures for this to be successfully implemented. - There will be an increased burden on the NSW independent regulator. **WA** - WA has only adopted the 1996 version of the ADWG.
Opportunities	**All States** - All States have already adopted the ADWG as the water quality standard. - Most utilities are pursuing compliance despite it currently only having guideline status. - The burden on some Health departments may be reduced as a result of this recommendation. - Most water utilities already report on planning to the NPR. - State water department resources will be freed up to assist with implementation of the Best Practice Management Framework. **Queensland and NSW** - DERM and DECCW resources will be freed up to assist with implementation of the Best Practice Management Framework.
Agents for Change	National Health & Medical Research Council (NHMRC), State Health departments, independent regulators in each State
Existing Instruments	State based legislation and regulations, operating licences, NPR

Table 12 Implementation Issues for Developing a Skilled Workforce

Barriers	**All States** - Qualified trainers are difficult to source in many regional areas - It is more difficult to attract skilled operators to regional communities
Opportunities	**All States** - Some utilities have entered into partnerships to aid in knowledge transfer amongst operators. - A number of utilities have already signed WIST's Charter for Aspirational Skills Commitments. - There are a number of NWC skills projects underway, including *H2Oz Careers in Water* and the Productivity Places Program. **Queensland and NSW** - Governance reform in NSW and Qld should improve knowledge sharing in these States. - Larger utilities are more likely to attract and retain trained staff due to increased promotion opportunities. **Victoria** - Victoria is currently piloting the Draft Code of Practice for Water Treatment Operator Competencies, which is an improved operator training framework.
Agents for Change	GSA, DEEWR, WIST, WIOA, AWA, Tertiary training institutions
Existing Instruments	COAG National Water Skills Strategy, Operating licences, ADWG

Table 13 Implementation Issues for Governance Reform in NSW and Queensland

Barriers	**Queensland and NSW** - Financial cost of governance reform to the Qld and NSW Governments. - Additional resources may be required by QCA and IPART. - Care needs to be exercised to ensure the most appropriate groupings of utilities **NSW** - State and Local Government inertia towards maintaining local government involvement in water supply and politicisation of the issue.
Opportunities	**Queensland and NSW** - Some local government restructures have recently taken place. Success of governance reform in other States. **Queensland** - The recent restructure in South East Queensland to form the SEQ Water Grid is demonstrating positive results. **NSW** - NSW has already initiated an Independent Inquiry into LWU reform. - LWU inertia or resistance towards alliances.
Agents for Change	COAG, DERM, DECCW, QCA, IPART
Existing Instruments	National Partnership Agreement

AECOM

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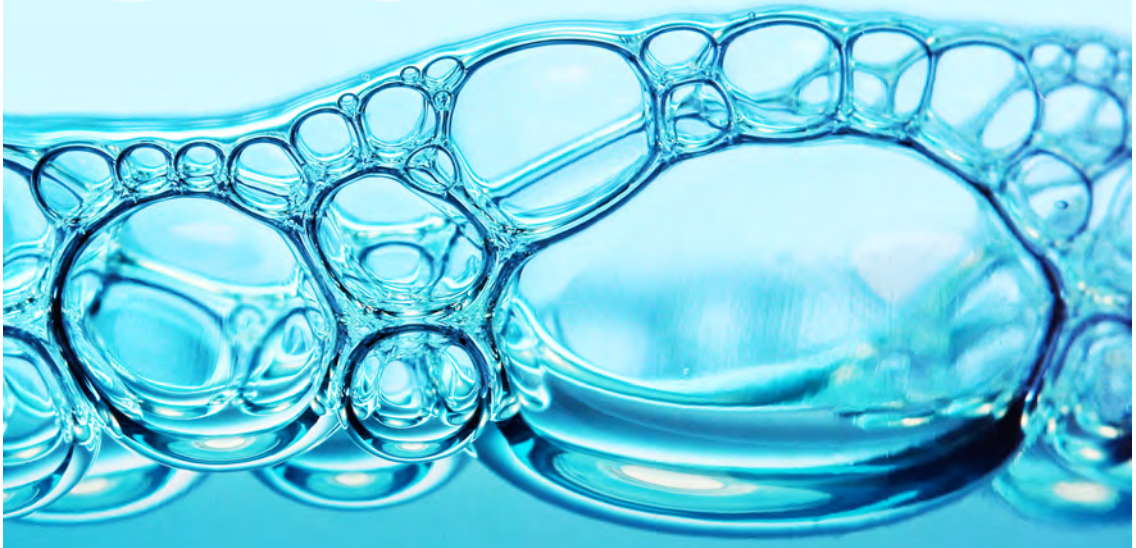

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