Institute for Sustainable Futures

UTS UNIVERSITY OF TECHNOLOGY, SYDNEY

Australian Water Recycling Centre of Excellence

Policy settings, regulatory frameworks and recycled water schemes

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ABOUT THE PROJECT

This national collaborative research project entitled "Building industry capability to make recycled water investment decisions" sought to fill significant gaps in the Australian water sector's knowledge by investigating and reporting on actual costs, benefits and risks of water recycling **as they are experienced in practice.**

This project was undertaken with the support of the Australian Water Recycling Centre of Excellence by the Institute for Sustainable Futures (ISF) at the University of Technology Sydney (UTS), in collaboration with 12 partner organisations representing diverse interests, roles and responsibilities in water recycling. ISF is grateful for the generous cash and in-kind support from these partners: UTS, Sydney Water Corporation, Yarra Valley Water, Ku-ring-gai Council, NSW Office of Water, Lend Lease, Independent Pricing and Regulatory Tribunal (IPART), QLD Department Environment & Resource Management, Siemens, WJP Solutions, Sydney Coastal Councils Group, and Water Services Association of Australia (WSAA).

ISF also wishes to acknowledge the generous contributions of the project's research participants – approximately 80 key informants from our 12 project partners and 30 other participating organisations.

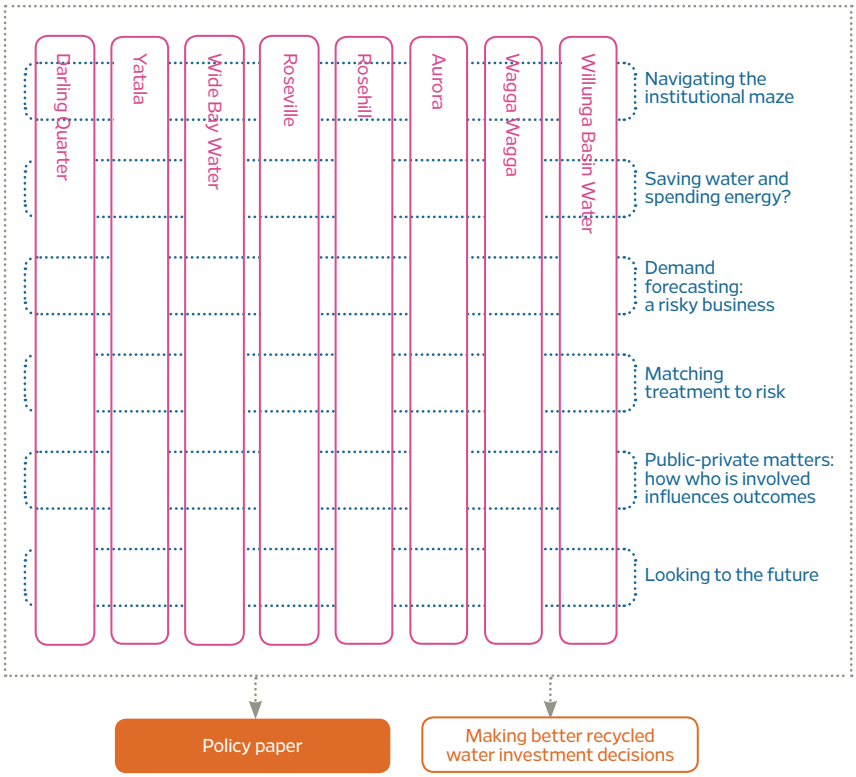
Eight diverse water recycling schemes from across Australia were selected for detailed investigation via a participatory process with project partners. The depth of the case studies is complemented by six papers exploring cross-cutting themes that emerged from the detailed case studies, complemented by insights from outside the water sector.

For each case study and theme, data collection included semi-structured interviews with representatives of all key parties (e.g., regulators, owners/investors, operators, customers, etc) and document review. These inputs were analysed and documented in a case study narrative. In accordance with UTS ethics processes, research participants agreed to participate, and provided feedback on drafts and permission to release outputs. The specific details of the case studies and themes were then integrated into two synthesis documents targeting two distinct groups: policy makers and investors/planners.

The outcomes of the project include this paper and are documented in a suite of practical, accessible resources:

- 8 Case Studies
- 6 Cross-cutting Themes
- Policy Paper, and
- Investment Guide.

For more information about the project, and to access the other resources visit www.waterrecyclinginvestment.com



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The Institute for Sustainable Futures (ISF) is a flagship research institute at the University of Technology, Sydney. ISF's mission is to create change toward sustainable futures through independent, project-based research with government, industry and community. For further information visit www.isf.uts.edu.au

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In brief

This paper draws on the project's eight scheme case studies to illustrate how recycled water scheme investment decisions are influenced by policy, legislation and regulatory frameworks in the following areas:

1) Environmental protection of receiving waters

- In several case studies, policies (and regulatory instruments) aimed at protecting receiving waters from the impacts of wastewater discharge were influential drivers of the initial development and/or subsequent expansion of water recycling schemes. In these case studies, scheme development was also enabled by strong intrinsic commitment by key decision-making individuals and organisations to reflect community values and protect the local environment.
- Discharge licence conditions can set the bar for water quality requirements of recycling schemes, but do not guarantee that recycling will be analysed as a potential option to meet these conditions.

2) Water security

- Input-based instruments such as grants and targets do not in theory incentivise efficient investment across the water sector. Nevertheless, from the perspectives of the utilities, Councils and private businesses involved, given the government grants available during the drought, the development and expansion of recycling schemes often represented a good value proposition for their constituents, customer bases and communities.
- However, not all private nor Council schemes required government grants for development to be feasible, nor were they necessarily driven by the availability of these grants.

3) Developer charges

- Although there are a number of complexities to designing appropriate methodologies for setting developer charges, capping or setting developer charges at a fixed rate (or setting some charges at zero) erodes the potential for these charges to signal economically efficient development, including for water recycling.

4) Recycled water scheme regulation to protect public health

- A major challenge facing agencies is how to design regulatory approaches for water recycling that protect public health and safety, while simultaneously achieving multiple and potentially competing policy objectives such as: encouraging (or removing barriers) to competition; ensuring water security; protecting the environment; and reducing red-tape.
- The number of recycled water schemes has grown over recent years, and in parallel there has been significant evolution in legislative and regulatory frameworks. Adequate resourcing of government agencies to fulfil regulatory functions is an ongoing issue in many jurisdictions.
- Several scheme owners or operators (private and Council) have had difficulties navigating the procedural complexity of approvals, licensing and compliance requirements. Many also have difficulties with meeting the requirements of the systems-based AGWR. While agencies generally agree that AGWR may not be required for adequate management of public health risks for lower-risk schemes, key questions remain on how to define risk levels for schemes and whether these definitions are best included in legislation, regulatory requirements, or non-statutory guidelines.

ABBREVIATIONS

AGWR	Australian Guidelines to Water Recycling
CUB	Carlton United Breweries
DEWS	Department of Energy and Water Supply
EPA	Environment Protection Authority
EPWP	Environmental Protection Policy
ESC	Essential Services Commission
IPART	Independent Pricing and Regulatory Tribunal
NOW	New South Wales Office of Water
NSW	New South Wales
QLD	Queensland
RWMP	Recycled Water Management Plan
SA	South Australia
SA Water	South Australian Water Corporation
STP	Sewage Treatment Plant
VIC	Victoria
WBWC	Wide Bay Water Corporation
WICA	*Water Industry Competition Act 2006 (NSW)*
YVW	Yarra Valley Water

Introduction

The eight case studies of Australian recycled water schemes in the project "Building Industry Capability to Make Recycled Water Investment Decisions" highlight many factors that can shape decisions about a scheme's inception, design and operation. A range of policy, legislative and regulatory settings influence recycled water schemes investment decisions and the sharing of costs, benefits and risks.

This paper draws directly on the case studies to summarise how recycled water scheme decisions are influenced by policies, legislation and regulation in the following areas:

1) Environmental protection of receiving waters - including load based licensing schemes
2) Water security and drought responses - including grants, targets and restrictions
3) Charging for infrastructure - focussing on developer contributions for new infrastructure
4) Scheme approvals and licensing - focussing on the protection of public health.

Policy and regulatory areas illustrated within the case studies

SCHEMES				POLICY, LEGAL AND REGULATORY SETTINGS			
SCHEME	DESCRIPTION	DEVELOPERS, OWNERS, OPERATORS AND RETAILERS	SOURCE	1. ENVIRON-MENTAL PROTECTION	2. WATER SECURITY	3. INFRA-STRUCTURE CHARGES	4. APPROVALS & LICENSING
Aurora VIC	Residential greenfield third-pipe	Public utility (Yarra Valley Water)	Sewage	✔	✔	✔	
Darling Quarter NSW	Residential and commercial precinct	Private developer (Lend Lease) Private operator and retailer (Veolia)	Sewage		✔		✔
Wide Bay Water (Hervey Bay) QLD	Irrigation reuse – crops and plantations; some industrial estate gardens	Public utility (Wide Bay Water Corp)	Sewage	✔	✔		✔
Rosehill NSW	Industrial reuse; some irrigation reuse	Private developer, owner and operator (AquaNet consortium) Public utility retailer (Sydney Water)	Sewage		✔		✔
Roseville NSW	Irrigation reuse – public open space and golf course	Local government (Ku-ring-Gai Council)	Stormwater		✔		
Wagga Wagga NSW	Irrigation reuse – public open space; crops	Local government (Wagga Wagga City Council)	Sewage	✔			✔
Willunga SA	Irrigation reuse – crops	Private utility (Willunga Basin Water Corporation)	Sewage	✔	✔		
Yatala QLD	Brewery reuse	Private company (Carlton United Breweries)	Onsite trade waste			✔	

1 Environmental protection

Reducing wastewater pollution of receiving waters

Background

In many locations, recycling wastewater for irrigation uses is driven by the need to reduce the discharge of nutrients, pathogens and other contaminants in wastewater into receiving riverine and coastal waterways. The objective of protecting and environment (as well as avoiding health impacts) is reflected in some jurisdictions in the legislative and regulatory frameworks for recycled water, and in the functions of environmental regulatory agencies. In some cases these environmental drivers pre-date the incentives for recycling created by the drought conditions across southern Australia throughout the 2000s, and the associated water security policies (summarised in section 2).[1]

Several of the case studies illustrate that the approach to regulating and licensing wastewater discharge influences where the bar is set for recycled water quality, and are instrumental, or at least influential, in the way that recycled water schemes (including treatment trains) are scaled, designed and operated. In practice, designers and operators of recycled water schemes often need to balance environmental protection and water security objectives on the one hand, with environmental flows benefits and the value of nutrients in reuse water for irrigation end uses on the other. As the number of recycled water schemes has increased, the licence and management plan requirements and associated guidelines have also evolved to provide clearer obligations and advice on how to balance these objectives.

In **Hervey Bay** in the late 1980s, the Council was faced with the task of dealing with wastewater generated from an increasing population in the region. This wastewater was discharging into local waterways and the coastal and marine environments of the Great Sandy Strait, a sand passage between the mainland and Fraser Island, which is of great ecological value and importance to the local community. The importance of protecting the ecosystems in the region is also embodied by the international legal recognition of the Great Sandy Strait environs under the *Ramsar Convention* and the *World Heritage Convention*.

Environmental protection regulation has subsequently influenced how the scheme is operated and has been a contributory driver of scheme expansion. Licence conditions require a percentage of wastewater be reused each year. In practice, interviewees noted the difficulties of ensuring licence conditions reflect the extent to which wastewater discharge impacts the environment and how the community values the environment. One limitation is that there are relatively limited specifically modelling or monitoring the ecological impact of wastewater discharge in the region, particularly given the multiple sources of pollution beyond wastewater discharge. The corporation is currently undertaking studies of the receiving environment from the discharge point at Pulgul WWTP.

Furthermore, with highly variable rainfall from year to year, the ability for the utility to re-use water on land as well as the level of impact varies considerably from year to year. Box 1 (next page) outlines how Wide Bay Water's license conditions for discharge of treated wastewater were changed to reflect this variability.

Case study illustrations

CASE STUDIES OF RECYCLED WATER SCHEMES			POLICY, LEGAL AND REGULATORY SETTINGS
Aurora VIC	Residential greenfield third-pipe	Sewage	Pollution licensing – nutrient management objectives
Wide Bay Water (Hervey Bay) QLD	Irrigation reuse – crops and plantations; some industrial estate gardens	Sewage	International law – Ramsar site and World Heritage site Pollution licensing – pollutant management objectives
Wagga Wagga NSW	Irrigation reuse – public open space; crops	Sewage	Pollution licensing – nutrient management objectives
Willunga SA	Irrigation reuse – crops	Sewage	Pollution licensing – pollutant management objectives

BOX 1
REGULATING ENVIRONMENTAL IMPACT – NEGOTIATING RISK-BASED DISCHARGE LICENCE CONDITIONS (HERVEY BAY, QLD)

The QLD Department of Environment and Heritage Protection (previously the Department of Environment and Resource Management) regulates activities that impact the environment under the *Environmental Protection Act 1994* (the 'EPA Act'). Wide Bay Water Corporation (WBWC), the owner and operator of recycling schemes in the **Hervey Bay** region, QLD, is required to have a development approval to operate their wastewater treatment plants, which includes licence conditions relating to environmental outcomes. The framework for operationalising the protection of water environments is provided by the *Environmental Protection (Water) Policy 2009* (the 'EPWP'), a subordinate legislation under the EPA Act.[2]

Under the EPWP, WBWC is obliged to adopt the stated management hierarchy for its wastewater treatment and discharge procedures; after water conservation measures and waste prevention options are exhausted, the EPWP prioritises treatment and release to land over release to surface waters and groundwater.[3]

A 90% reuse target was set as an aspirational target, but became a condition of WBWC's licence issued under the EPA Act. This condition has been instrumental to driving expansion in the WBWC scheme, although meeting it is difficult in wet years.

WBWC and the Department of Environment and Resource Management successfully worked together to change the reuse target to 90% of Average Dry Weather Flow. This reflected the situation in wet conditions, during which there are increased inflows, reduced opportunities for land-based reuses, and lower marginal environmental impact of effluent discharge.

Separate licence conditions are set for each of the two main, interconnected treatment plants with discharge points, Pulgul and Eli. WBWC and the Department of Environment and Heritage Protection are currently negotiating a bubble licencing arrangement for these plants in recognition that impacts are largely cumulative, rather than dependent on discharge from a single sewage treatment plant.

Even in situations where environmental protection is not the main driver for recycling, environmental protection goals can be an important enabler of scheme development. The **Willunga** Basin Water Corporation scheme, which draws on treated wastewater from SA Water's Christies Beach Sewage Treatment Plant (STP) to irrigate vineyards in the McLaren Vale region in SA, was initiated by a group of private vineyard owners who were facing declining groundwater availability in their region. Nevertheless, a key enabling factor was the 30-year agreement (with optional 10 year extension) for SA Water to supply treated wastewater to the water corporation, initially at no charge, and the certainty that this length of agreement provides from the perspective of the private utility and their investors. A key benefit for SA Water is that the diversion of treated sewage onto land reduces the discharge of wastewater to Spencer Gulf and the potential impact on marine and coastal ecosystems.

In many jurisdictions, a load-based approach to regulating pollution applies. This approach is based on a "polluter pays" principle and involves setting fee structures to reflect the potential environmental impacts from pollution, which depend on the type of pollutant and the receiving environment. The objective of load-based licensing schemes is to encourage businesses to adopt a least-cost approach to managing their pollution to meet their annual load limits.[4] However, load-based licensing does not necessarily drive water recycling, as it may not always represent least-cost abatement compared to treatment options. Furthermore, the existing of a LBL scheme does not guarantee that recycling will be considered as an option. Box 2 outlines how environmental regulation drove the STP upgrade but has had less influence on **Wagga Wagga** City Council's recycled water schemes.

In inland catchments, environmental protection considerations can pull the design of recycled water schemes and the level of treatment in different directions: recycled water represents a potential benefit in terms of environmental flows, but this requires balancing against the impacts of nutrient discharge. In the case of the Aurora greenfield residential development in north-west Melbourne, the policies and objectives for nutrient management in riverways and Port Philip Bay outweighed the potential benefit from environmental flows. Ultimately, Melbourne Water opposed the scheme discharging to waterways, and the Environment

Protection Authority (EPA) did not issue a winter discharge licence - which resulted in additional storage requirements and costs for the scheme. Since that time, new requirements and guidelines have been introduced for the planning and management of health and environmental impacts of purple-pipe recycled water schemes (Health and Environmental Management Plans).[5] Interviewees reported that these have clarified best-practice approach to assessing and comparing the environmental risks posed by recycled water schemes.

BOX 2
REGULATING ENVIRONMENTAL IMPACT – DRIVING TREATMENT UPGRADE, BUT NOT RECYCLING
(WAGGA WAGGA, NSW)

The NSW EPA regulates activities that impact the environment under a range of legislation including the *Protection of the Environment Operations Act 1997*. The EPA administers load-based licences, which limit the total amount of pollution emitted each year but do not prescribe any specific pollution reduction controls. All licence holders pay an administration fee and, when prescribed pollutants are emitted, a pollutant load fee is charged based on the pollutant concentration, volume and the type of discharge point location.

In approximately 2006, after several years of negotiation, the EPA scheduled new concentration limits for Wagga Wagga City Council's licences to discharge treated sewage into the Murrumbidgee River for their Narrung and Kooringal sewage treatment plants (STPs). Wagga Wagga City Council's Environment Protection Licences were altered by the EPA to include a Pollution Reduction Programme (PRP) to be achieved by the end of May 2010. The existing sewage treatment plants did not have the capability of achieving the lower pollutant concentration limits specified in the PRP and so an augmentation project was required so as to comply with the PRP.

The EPA extended the May 2010 date in acknowledgement of Council's capital investment of $44 million and the lead time needed to complete the project. The Narrung and Kooringal STPs were formerly a mixture of trickling filter and activated sludge plants followed by 30 day tertiary ponds. These plants have since been upgraded to a combination of activated sludge sequential batch reactors with dual media tertiary filtration, followed by chlorine disinfection and chemical and biological phosphorous removal and centrifugal bio-solids treatment. The biosolids are composted or reused on agricultural land.

Interviewees noted that when the load limits were reduced by the EPA, Council management committed to the STP upgrade. However, the changing of the licence conditions did not at the time drive a systematic or comprehensive analysis of extending the recycled water scheme. As highlighted in the case study, while focussing on meeting discharge load limits the Council initially tried to investigate compliance requirements for Section 60 approval of their existing recycling scheme in line with the Australian Guidelines for Water Recycling 2006 (AGWR). However, due to a lack of clarity from regulators as to exactly what was required the Council felt they had little choice but to deal with the Section 60 approvals retrospectively after the STP upgrades were complete.

Under the conditions of a load-based licence, recycling wastewater and utilising it on land could theoretically result in zero discharge load and hence reduce the pollutant fee to nil. However, given the very low loads achieved in discharges from the upgraded treatment plants, the load-based fees do not create an incentive for Wagga Wagga City Council to invest in recycling. Currently, consideration of longer-term water security priorities and the general perception that water recycling in a dry inland region makes sense for a combination of reasons, rather than environmental impacts of discharge per se, is the major influence on Council's consideration of future water recycling schemes.

Discussion Points

Wastewater recycling has the potential to reduce the environmental impacts of discharge on inland and coastal waters. As discharge licence conditions are influential in determining whether and at what scale recycling is cost-effective, it is critical for regulators, in setting these conditions, to be well informed by the environmental impacts of wastewater discharge, as well as how the community values the environment.

Any approach to elicit the economic value of the environment needs to be based on information about how the aesthetic as well as ecological attributes of the environment are affected by sewage discharge. However, in many situations there can be limited specific understanding about ecological systems responses, and studies may be conducted on a scale too broad to reflect the impact from a specific sewage treatment plant.

Even where ecological analysis is available, in practice the community's values are rarely directly incorporated into the setting of the specific conditions of a licence (although they may be generally reflected in licensing principles). Economic valuation studies such as choice modelling could be used to quantify in monetary terms the value that a community places on the environment, but such studies come with challenges: they are difficult to do well so are often done badly; the cost of undertaking such studies well is often prohibitive; and the values elicited are particular to a time and place, and are not generalisable, so the decision to invest in such studies needs to be thought through carefully.[6]

How can discharge licence conditions, which can be instrumental in determining the cost-effectiveness of wastewater recycling, be better informed by information about ecological responses and how the community values the environment?

2 Water security

Investing in water recycling schemes in response to drought

Background

The 'millennium drought' across much of southern Australian throughout the 2000s and the associated policy responses were major drivers for substantial investment in water infrastructure[7] including many recycled water schemes. During this drought, rainfall and inflows decreased substantially and storage levels in many major urban water systems continued to drop. Many of the responses to drought were precipitated by the mode of "crisis" and the need to rapidly close the supply-demand balance, but many infrastructure decisions failed to systematically consider all options, their costs, and their effectiveness in ensuring water security under uncertain rainfall conditions.[8]

During the drought, recycled water targets were established by state governments as a key regulatory instrument, which were accompanied by substantial state as well as federal funding in support of developing or expanding recycled water schemes. Water restrictions, particularly on outdoor uses, also influenced the uptake of water recycling for irrigation of sportsfields and parks.

The National Water Commission and the Productivity Commission, in their recent analyses of reform needs in the urban water sector, have made clear recommendations for planning and investment decisions to be guided by overarching objectives rather than targeting specific options.[9] Nevertheless, while identifying water recycling targets as specific examples, recommendations against input-based regulations do not apply solely to water recycling over other types of supply decisions. As the case studies illustrate, recycled water schemes were not the only infrastructure type that received targeted funding during the millennium drought.

Although grants played a substantial role in driving investment in recycled water, these decisions were made in a playing field that was far from even. From the perspectives of the utilities, Councils and private businesses involved, given the grants available, the development and expansion of recycling schemes often represented a good value proposition for their constituents, customer bases and communities. Anticipated water security benefits might have been subsequently eroded with the arrival of la niña flooding rains in 2010, but also by the development and targeted funding of other supply infrastructure.

State-based recycled water targets were key to enabling several of the recycled water schemes in the case studies. In 2002, a target to achieve 20% water recycling of Melbourne's sewage by 2010 was established by the Victorian government. This target reinforced Yarra Valley Water's (YVW) commitment to

Case study illustrations

CASE STUDIES			POLICY SETTINGS AND REGULATIONS
Aurora VIC	Residential greenfield third-pipe	Sewage	State government recycled water target
Darling Quarter NSW	Residential & commercial precinct	Sewage	*Green* Star
Wide Bay Water (Hervey Bay) QLD	Irrigation reuse – crops and plantations; some industrial estate gardens	Sewage	State government grants
Rosehill NSW	Industrial reuse; some irrigation reuse	Sewage	State government recycled water target Water restrictions Other targeted water security investments
Roseville NSW	Irrigation reuse – public open space and golf course	Stormwater	Water restrictions Federal government grants State government grants
Willunga SA	Irrigation reuse – crops	Sewage	State government grant Federal government grant

the **Aurora** scheme and encouraged their decision to take on responsibility for scheme design and construction. The **Rosehill** industrial water recycled scheme was initiated and developed by a private consortium, but the alignment with the NSW government's wastewater reuse target of 70 gigalitres of potable water savings by 2013 was an important factor determining Sydney Water's involvement in the scheme and their adoption of demand risk.[10]

Federal and state government grants were instrumental in the development of **Regulating environmental impact** recycling scheme, for irrigation of Council parklands and a neighbouring private golf course. The Ku-Ring-Gai Council had previously considered stormwater harvesting as an alternative source of water, but costs had been prohibitive. The announcement in 2007 of various grant programmes drove Council's development of the scheme.

For other schemes that had originally developed prior to the millennium drought and without (substantial) state or federal government grants, the new funds available for water recycling scheme made scheme expansion feasible. In **Hervey Bay**, QLD, the driver of environmental protection coupled with the incentive of new grants spurred ongoing investment in scheme development. In **Willunga**, SA, the scheme was initiated by private irrigators and had been operating without direct government grants for over a decade. However, government funding for water security and SA Water investments have enabled the scheme to expand access to an increasing number of the region's grape growers. Box 3 (next page) summarises the grants utilised across the case studies.

Water restrictions policies have also influenced the decisions by customers of recycled water schemes. Some customers of the **Rosehill** scheme considered their involvement essential to ameliorate the business risk that water restrictions would be imposed on industrial customers. Other customers considered that given the overall drought situation including declining dam levels and restrictions on households, they were keen to demonstrate their commitment as a business to saving potable water.

Drought and water security concerns have also influenced the private sector to invest in recycled water schemes because of influences not directly related to government grants, restrictions or other policies. For example, the private growers who established the **Willunga Basin Water Scheme** were facing exhaustion of the local groundwater supplies, and securing an alternative water resources was essential for McLaren Vale to continue as a wine-producing region. For the proponents of the **Darling Quarter** precinct development in Sydney the main driver for implementing water recycling was to gain a six-star rating under the (voluntary) Green Building Council of Australia's scheme, rather than any mandatory requirement.

BOX 3

GRANTS FOR RECYCLED WATER SCHEMES

(HERVEY BAY, QLD | ROSEVILLE, NSW | WILLUNGA, SA)

Three of the eight recycled water schemes featured in case studies received federal and/or state government grants for scheme development or expansion:

Hervey Bay, QLD

From 1998 to 2009, the WBWC received a total of about $14 million across 11 grants from State and Federal governments for scheme construction and land purchase. The grants were driven by a range of goals, including nutrient removal, sugar industry reform, as well as water security.

From 1989 to 1992, WBWC spent $1.6 million in capital costs on scheme development. From 2004-2011, WBWC spent about $6.6 million on land and $4.8 million on construction, in addition to the grants received.

Roseville, NSW

Ku-ring-gai Council spent a total of approximately $290,000 on capital and project management costs. Approximately $240,000 of this total was provided to the Roseville Golf Club for their purchase and installation of the gross pollutant trap for the recycling system. The Council costs were in part offset by a $113,000 grant received from the NSW Government's *Climate Change Fund Public Facilities Program.*

The Roseville Golf Club spent $340,000 on construction costs and an additional $500,000 on a dam. As indicated above, approximately $240,000 of the $340,000 construction costs were offset by Council. The Club also received $450,000 from the federal government's *Community Water Grant Scheme*, under the *Water for the Future Initiative*, and $50,000 from the NSW State Government's *Water Saving Fund.* These grants were made available partly for recycling and also for other water savings investments made by the Gordon Golf Club.

Willunga, SA

The Willunga Basin Water Cooperation scheme was primarily developed with $7 million in start-up capital from private investors. It operated from 1999 with its operating costs covered by rates from irrigation customers.

Since 2009, scheme expansion has been funded via the City of Ongkaparinga's Waterproofing the South initiative. Funding for this initiative includes $34.5 million from the Australian Government Water for the Future initiative, $139 million from SA Water, $0.8 million from the South Australian Government's Department for Planning and Local Government, and $3.9 million from the City of Onkaparinga. The *Waterproofing the South* initiative has also received $1.2 million from the Adelaide and Mount Lofty Ranges Natural Resources Management Board. The Willunga Basin Water Cooperation co-invested $6.8 million for network expansion. Customers have also accessed approximately $2 million in grant funding to construct infrastructure required to move them off the mains water grid and on to the recycled water network.

Discussion Points

In response to the last drought, utilities across many jurisdictions constructed large-scale supply infrastructure, and in eastern states there now is excess supply capacity for a decade or more. The cost-effectiveness of these decisions has since come under scrutiny, but as the costs are sunk, over the next 10-20 years recycling is unlikely to present itself as a cost-effective option (at least in Australia's eastern states).

Many of our interviewees were of the view that indirect or direct potable reuse could potentially transform the cost-effectiveness equation for recycling, and noted advances in implementing aquifer recharge in Western Australia. However, a fundamental barrier is community misperceptions about risks. Interviewees called for more concerted and coordinated industry efforts towards informing and shaping community perceptions about the real nature of risks and benefits.

What role can the water industry play in informing and shaping community perceptions about potable reuse?

3

Developer charges

(Dis)incentivising economically efficient water recycling schemes

Background

Developer charges are up-front charges levied by water utilities on developers for the costs of providing or upgrading infrastructure for new developments. The setting of location-specific developer charges has the potential to provide a signal for locating new developments in an economically efficient manner, particularly where postage-stamp pricing occurs for existing customers.[11]

However, in practice, there are a number of complexities to setting developer charges in an efficient way, and water businesses and economic regulators in various jurisdictions have long debated what approach to take.

In recent years, housing affordability policies have also influenced how developer charges are set. Drawing on examples from beyond our case study schemes, in December 2008 the New South Wales Government set the maximum developer charges for water and sewerage, but excluding recycling schemes, at zero, on the basis of housing affordability policy goals.[12] In May 2011, the QLD Government capped developer charges (for all infrastructure types) as part of their strategy to improve housing affordability.[13]

The efficacy of capping developer charges at meeting housing affordability goals is beyond the scope of this paper to discuss. What is relevant to note is that by capping, removing or otherwise setting developer charge at uniform levels, these charges cannot signal efficient investment by location. Where developer charges are reduced to zero for water infrastructure except for recycled water schemes, as in Sydney Water and Hunter Water's areas of operations,[14] this potentially creates an uneven playing field with developers discouraged from developing recycled water schemes. However, it is administratively less complex to calculate and apply set charge levels than to apply and assess the application of a methodology for calculating developer charges.

In two of the case studies, the approach to setting developer charges, and changes to this approach, have significantly influenced the costs and benefits of recycled water schemes.

A key driver for Carlton United Breweries (CUB) to undertake on-site tradewaste recycling at their brewery in **Yatala**, QLD was the potential to avoid headworks charges. With the closure of its Kent Brewery in Sydney it had to relocate production to its Yatala brewery, and expand operations at this site. If CUB had implemented their expansion plans without any reduction in the rate of tradewaste discharge, the local Council would have had to undertake significant upgrades to the wastewater treatment plant. In 2004, the estimated "headworks charge", that would have been levied by the local council on CUB would have been around $5.7 million. Avoiding this headworks charge and reducing their tradewaste discharge fees by 30%, combined with the uncertainty of relying on local council timing for treatment plant expansion, underpinned the business case for CUB to invest $6.5 million (in 2004 dollars) in on-site recycling infrastructure. The driver to avoid headwork costs illustrates the importance for utilities and regulators to ensure that prices are cost-reflective, and avoid that incorrect pricing signals lead to inefficient decisions to the network as a whole.

A major mid-project change to developer charges had a substantial influence on the cost equation for YVW in their development of the recycling scheme at the

Case study illustrations

CASE STUDIES			POLICY AND REGULATIONS
Aurora VIC	Residential greenfield third-pipe	Sewage	Uniform developer charges
Yatala QLD	Brewery reuse	Onsite trade waste	Headworks charges

Aurora residential greenfield site, north-west of Melbourne. In 2004, the Essential Services Commission (ESC) was expanded to include regulation of Victoria's water and sewerage services,[15] including the setting of developer charges. Following a lengthy assessment and review process, during which many Victorian water businesses argued against the ESC's approach, the ESC's Final Determination set developer charges at a flat rate of $500 per lot for water and $500 per lot for sewerage (see Box 4). This was significantly lower than the already-discounted developer contributions previously agreed between YVW and the developer. The resulting revenue shortfall has been borne by YVW's broader customer base. Because YVW could recover the costs through postage-stamp pricing, and there were a variety of dynamic drivers for the scheme, alternative setting of developer charges would not likely have by themselves changed YVW's decision to develop a recycling scheme at Aurora.

BOX 4
NEW CUSTOMER CONTRIBUTIONS AND RECYCLED WATER FOR GREENFIELD DEVELOPMENTS
(AURORA, VIC)

The Essential Service Commission (ESC) is Victoria's independent economic regulator of prescribed essential utility services supplied by various industries. In September 2004, following an expansion of the ESC's role to include regulation of water and sewerage services, the Victorian urban and rural water businesses including YVW submitted plans to the ESC that set out the prices for water, sewerage and other related services for the three years commencing 1 July 2005.

In assessing the proposed prices, the ESC applied the principles set out in the *Water Industry Regulatory Order* and conducted consultation with businesses and other stakeholders. In March 2005, it released a Draft Decisions indicating that for each water businesses, the ESC proposed not to approve the proposed prices. During the review process, the approach to setting and the levels of new customer contributions was the subject of significant, protracted debate between water businesses, the development industry and the ESC.

As noted by the ESC in its final determination[16] and by case study interviewees, water businesses agreed with the ESC that there was a need for greater consistency in price-setting approach. However, the Victorian water industry argued strenuously against the ESC's proposed approach, which would substantially reduce the revenue from new customer contributions. One key concern from individual water businesses, VicWater and the Urban Development Institute was that the proposed changes would have an adverse impact on the sustainability of investment decisions:

"[Not allowing sunk costs] would lead to a shift in investment decisions towards those that made no allowance for future growth."[17]

The ESC, however, argued that businesses would have certainty of recovery of efficient capital expenditure over the life of the asset even if not paid for upfront. They also noted that "including sunk costs in the calculation of new customer contributions overstates the incremental costs caused by the connection of a new customer and hence is not likely to promote efficient decisions".[18] The ESC approach emphasised the importance of applying an incremental cost approach, that is, the cost incurred to service the development that would not have otherwise occurred if the development had not taken place.

The ESC noted there was insufficient time available in the review to accurately calculate incremental costs, and that "the level of new customer contributions, if calculated on the basis of incremental costs, is unlikely to be significant and is more likely to be closer to $0 than the values proposed by the businesses".[19] Hence the ESC's final decision for the first regulatory period was to apply a notional, flat charge of $500 per lot for water and $500 per lot for sewerage.

YVW interviewees noted that for the Aurora development, the incremental cost, even excluding sunk and shared costs, was not close to zero, irrespective of the costs of the recycling scheme. This was a greenfield development in an urban fringe area without existing trunk infrastructure. YVW estimates that the incremental cost of provision was closer to the charges previously agreed between YVW and the developer of $4608 per lot for sewer and $3817 per lot for water infrastructure. This case illustrates that the uniform nature of the ESC final determination, made on the assessment of average or 'typical' development situations, can have significant impacts on who bears the costs of water infrastructure for specific developments. »

Since this first determination, there have been many disputes between water corporations and the ESC about the uniform rules based framework. The ESC, in its August 2012 *Guidance Paper for New Customer Contributions*, noted that the issue of setting developer charges is "complex and emotive." Since August 2013 a new framework has been in place, developed by the ESC in consultation with industry. This framework is based on a number of principles, including that new customer contributions are based on incremental costs. Critically, from the perspective of the water industry, the definition of incremental cost can include an allocation of historical costs that the corporation had prudently prebuilt in expectation of future growth.

Discussion Points

NSW and Queensland governments have capped or set developer charges to zero, in order to pursue housing affordability goals. However, several of our interviewees expressed widespread doubt as to whether this has been actually effective in increasing housing development, or whether, for example, increased developers' returns. Furthermore, without developer charges, or with developer charges that are not related to the cost of providing infrastructure, there is an absence of a price signal for location-efficient investment. Given that public water utilities charge postage-stamp pricing and can recoup costs through their broader customer bases, the absence (or capping) of developer charges creates an "uneven playing field" that may prevent economically efficient investment by the private sector in distributed systems such as recycling.

What empirical evidence is there that capping or limiting developer charges has been effective in promoting housing affordability?

How can developer charges best be designed to be cost-reflective – that is, to incentivise economically efficient development that takes into account the costs of water and wastewater infrastructure servicing – whilst achieving simplicity of implementation and contributing to urban liveability goals?

4 Recycled water scheme regulation

Protecting the public from health and safety risks

Regulators and policy departments across Australian jurisdictions are currently grappling with complex questions of how to regulate owners and operators of recycled water schemes, including major water utilities, local councils, or private businesses.

A major challenge is how to design regulatory approaches that protect public health and safety, while balancing multiple objectives such as enhancing competition, meeting water security objectives, protecting the environment, and reducing red-tape. In various states, agencies have been implementing and developing risk-based approaches to designing regulation, and as a result dealing with complex questions about what this means in practice for: legislation; regulation; statutory and non-statutory guidelines; allocation of responsibilities between agencies; and corresponding agency resourcing requirements.

The number of recycled water schemes has grown over recent years, and in parallel there has been significant evolution in legislative and regulatory frameworks. A number of gaps have been identified, as in some cases legislation was drafted at a time when water recycling, particularly for residential and commercial end-uses, was less common. Targeted Study 6: *Navigating the Institutional Maze* outlines the gaps in the statutory approval for metropolitan councils operating recycled water schemes, and the case study on the **Roseville** scheme also draws on the experience of Ku-Ring-Gai Council. The gap in approval requirements for metropolitan Council recycling schemes is currently being addressed in the NSW Government's *Urban Water Regulation Review*.[20] Other issues relating to regulating recycled water, as detailed in the case studies, are illustrated in the table below.

The **Wagga Wagga** City Council is required under Section 60 of the *Local Government Act 1993* (NSW), to obtain ministerial approval for the construction or modification of water or sewerage works. This section was not drafted with recycled water schemes in mind, but has since been used as the basis for requiring approval of non-metropolitan council recycled water schemes. The Council has a lengthy history of operating water recycling schemes, mainly for irrigating crops and public open spaces. They are currently seeking Section 60 approval but have found the process lengthy and challenging, given their resources. Council undertook major upgrades to their sewage treatment plants (STPs) in the late 2000s, and at that time attempted to discuss with regulators the requirements of the then newly introduced *Australian Guidelines to Water Recycling*, to gain Section 60 approval for their existing recycling scheme. However, due to a lack of clarity in what was required, Council decided to put Section 60 approval to the side until after the STP upgrades were complete. They are now likely to have to implement increased treatment for water used in their recycling schemes in order to obtain Section 60 approval (See Box 5, next page).

Case study illustrations

CASE STUDIES			POLICY SETTINGS AND REGULATIONS
Darling Quarter NSW	Residential & commercial precinct	Sewage	*WICA Licensing*
Wide Bay Water (Hervey Bay) QLD	Irrigation reuse – crops and plantations; some industrial estate gardens	Sewage	RWMP requirements
Rosehill NSW	Industrial reuse; some irrigation reuse	Sewage	*WICA Licensing*
Wagga Wagga NSW	Irrigation reuse – public open space; crops	Sewage	LGA s60 approval requirements

BOX 5

APPROVAL FOR A LONG-OPERATIONAL RECYCLED WATER SCHEME
(WAGGA WAGGA, NSW)

Under Section 60 of the *Local Government Act 1993*, non-metropolitan councils must obtain Ministerial approval prior to constructing or extending water supply, water treatment or sewage works. The primary purpose of Section 60 (and its predecessor, section 396 of the *Local Government Act 1919*) was to regulate the supply or essential water and sewerage services provided by council outside of Sydney Water and Hunter Water's respective areas of operation. Although it was not drafted with water recycling schemes in mind, Section 60 has been used as the basis for non-metropolitan councils to require approval for their recycled water schemes.

Approval authority is delegated from the Minister to the NSW Office of Water (NOW). Although Section 60 does not require application of the AGWR, NOW's practice is to require councils to submit a Recycled Water Quality Management Plan that demonstrates compliance with the 12 elements of the AGWR.[21]

In 2008/09 whilst upgrading their STPs in line with the EPA Pollution Reduction Program Wagga Wagga City Council decided to pursue advice from NOW about gaining Section 60 approval for their existing recycling scheme. However, after approaching NOW with draft documentation using the guidance materials available the regulator rejected the application. Council sought clarification on what was required for formal application but found the type of guidance the Council needed was not readily available. Due to the urgency of the STP upgrades, lack of clarity on how to move forward on gaining Section 60 approval for the recycling scheme and limited Council resources, Council felt they had little choice but to deal with the Section 60 approvals retrospectively after the STP upgrades were complete. Council have subsequently been involved in lengthy negotiations and discussions with NOW to obtain approval for their recycling scheme. The requirement to demonstrate compliance with the AGWR, and the approvals process in general, has proved difficult for the time- and resources-constrained Council. From the Council's perspective, they are seeking clear guidance from the regulators on what measures to implement to gain approval for what they consider is a relatively low-risk scheme. The AGWR is however intended to encourage a systems-based process to recycled water scheme design and management, rather than a prescriptive approach.

Consequently, Council are currently in discussions with NOW, with the support of a consultant, about what additional controls are required in order to obtain Section 60 approval. Despite these challenges, Council recognise the importance of meeting the AGWR and obtaining Section 60 approval to managing the public health and safety risks to their community, as well as to limit the business and reputational risks to Council.

Two of the case study schemes are operated by private companies who hold licenses regulated by the Independent Pricing and Regulatory Tribunal (IPART) under Water Industry Competition Act (WICA). This licensing and access elements of this Act aim to enhance competition in the provision of water services while ensuring continued protection of public health and safety, the environment and consumers. The licensing elements of the scheme were also designed around regulated high-risk schemes that had not previously been adequately regulated. Interviewees in both the **Rosehill** industrial scheme and the **Darling Quarter** precinct development were broadly supportive of the WICA framework and noted that the level of complexity and regulation was generally appropriate given the large and complex nature of their recycled water schemes. Interviewees for the Darling Quarter case study did note that they would have appreciated an audit being required earlier in their design process, to identify treatment requirements for approval (see box 6).

In QLD, the Department of Energy and Water Supply (DEWS) (previously the Department of Environment and Resource Management) regulates the production and supply of certain types of recycled water, in the interests of protecting public health. Recycled water providers are required to comply with the specific provisions of *Water Supply (Safety and Reliability) Act 2008*. This legislation, administered by DEWS, introduced a regulated requirement for recycled water providers to prepare a Recycled Water Management Plan (RWMP) documenting their risk-based system. DEWS adopted a risk-based approach to establishing the required timelines for providers of recycled water in existing schemes to prepare these plans. Higher risk dual reticulation schemes or those for the irrigation of minimally processed food crops were the first to require an approved RWMP.[22]

BOX 6
AUDIT FRAMEWORK UNDER WICA 2006
(DARLING QUARTER, NSW)

The WICA was introduced by the NSW Government "as part of its strategy for a sustainable water future to harness the innovation and investment potential of the private sector in the water and wastewater industries".[23] The Act also establishes a licensing regime for private sector businesses involved in operating water industry infrastructure, supplying potable or non-potable water, or providing sewerage services.

The Act sets out how licences are audited and enforced. Effectively, licencees are required to conduct the following types of audits:[24]

1) Licence plans audit – before commercial operation, an audit of the adequacy of infrastructure operating, water quality, sewage management or retail management plans (as relevant)
2) New infrastructure audit – before commercial operation, an audit of whether the infrastructure complies with regulatory requirements, is capable of operating safely and in accordance with plans
3) Operational audit – after commercial operation, periodic risk based audits that monitor compliance with legislative requirements

IPART may also require incident-related audits in response to significant compliance issues.

Interviewees in the Darling Quarter case study noted that as required under WICA they conducted the first audit during the commissioning phase, which identified additional chlorination requirements. They noted that it was costly to implement this at this stage, and that they have discussed with IPART about how some of this cost could have been avoided if they had undertaken an audit earlier in the design process.

A Fact Sheet by IPART about the WICA Audit Framework (issued subsequently to the commissioning of the Darling Quarter scheme) recommends that licensees elect to have certain parts of their plan audited early. Unlike the three audits listed above, these "technology/sustainability assessments" are not required under WICA but have been recommended by IPART.

"We strongly recommend the licensee has certain parts of their plans audited before investing in detailed design of non-potable water and sewerage schemes. We recommend that if it is not possible to complete prior to detailed design that the assessments are undertaken prior to construction when significant capital costs are invested in the scheme."[25]

All other water recycled water schemes, including those at **Hervey Bay**, have until 1 July 2014 (extended from the original deadline of 1 July 2013) to submit RWMPs.

The WBWC is in the process of developing their RWMP. As they have a recycled water team and available personnel, they have not found the plan development an overly onerous process. As they had a number of controls in place, as a result of applying the guidelines they have had to make only minor changes to sampling frequency. Other councils and providers however have utilised external consultants to help them prepare their plans.

Discussion Points

In various jurisdictions policy-makers and regulators are grappling with how to match the "level of regulation", and the timing for introducing regulatory requirements such as recycled water management plans, with the "level of risk" posed by a recycled water scheme.

There are many possible dimensions to classifying risk – by source, treatment train, end-uses, and capacity of operators. Generalised categories can be problematic, because the level of risk depends on the combination of controls and procedures in place for each scheme. Defining risk categories in legislation or even regulation can limit regulators' flexibility to tailor licensing and compliance approaches to the level of risk posed on a scheme by scheme basis.

Furthermore, as government agencies have limited and in some cases shrinking resources, the role of government in providing information and building industry capacity – whether to councils or the private sector – is increasingly constrained. Developing voluntary guidelines[26] and building sector capacity could, however, be an important way of mitigating health and environmental risks.

How can classifications and categories of recycled water scheme risks best be incorporated into regulatory and licencing arrangements such that adequate treatment is incentivised and implementation is smooth and cost-effective for all parties in diverse schemes?

What is the potential role for governments in building sector capacity (e.g., providing information and training) and in promoting "voluntary" approaches to managing risks? What role might other institutions play (e.g., sectoral associations, private providers, etc) ?

Summary

This paper has sought to address and explore the points of intersection between our case studies and relevant policy, regulation, and legislation. The stories of these intersections raise complex questions that could be a useful starting point for discussions and investigations that progress the goal of creating conducive institutional arrangements for efficient and effective investment in water recycling by diverse players.

How can discharge licence conditions, which can be instrumental in determining the cost-effectiveness of wastewater recycling, be better informed by information about ecological responses and how the community values the environment?

What role can the water industry play in informing and shaping community perceptions about potable reuse?

What empirical evidence is there that capping or limiting developer charges has been effective in promoting housing affordability?

How can developer charges best be designed to be cost-reflective – that is, to incentivise economically efficient development that takes into account the costs of water and wastewater infrastructure servicing – whilst achieving simplicity of implementation and contributing to urban liveability goals?

How can classifications and categories of recycled water scheme risks best be incorporated into regulatory and licencing arrangements such that adequate treatment is incentivised and implementation is smooth and cost-effective for all parties in diverse schemes?

What is the potential role for governments in building sector capacity (e.g., providing information and training) and in promoting "voluntary" approaches to managing risks? What role might other institutions play (e.g., sectoral associations, private providers, etc) ?

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