Institute for Sustainable Futures

UTS UNIVERSITY OF TECHNOLOGY, SYDNEY

Australian Water Recycling Centre of Excellence

Public-private matters: how who is involved influences outcomes

This cross-cutting theme illustrates the very strong relationship in this project's case study recycled water schemes between the public or private nature of the proponents and key performance characteristics. In terms of drivers for a scheme's implementation, five were identified across the case studies: the three publicly oriented drivers were shared across the case study schemes, but the two private drivers were not shared by public proponents. The anticipated beneficiaries; distribution of costs, benefits and risks across key participants; types of risks and risk mitigation strategies are also shown to reflect the public or private nature of proponents.

This study is funded by the Australian Water Recycling Centre of Excellence under the Commonwealth's Water for the Future Initiative

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.

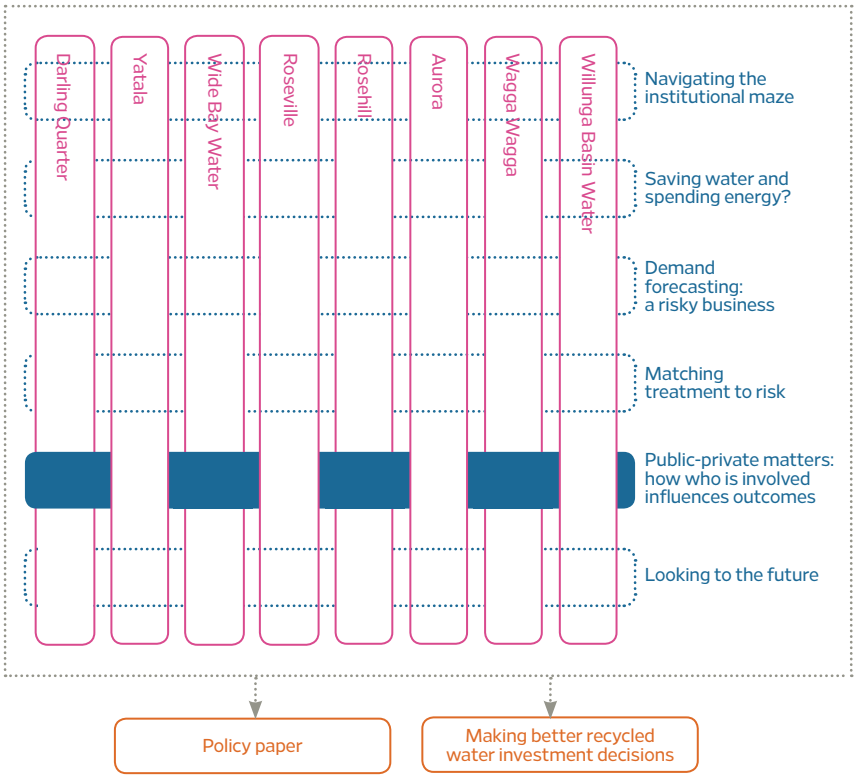
Eight diverse water recycling schemes from across Australia were selected for detailed investigation via a participatory process with project partners. The depth of the case studies is complemented by six papers exploring cross-cutting themes that emerged from the detailed case studies, complemented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



ABOUT THE AUTHORS

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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CITATION

Please cite this document as: Institute for Sustainable Futures (2013), Public-private matters: how who is involved influences outcomes; Building Industry Capability to Make Recycled Water Investment Decisions. Prepared by the Institute for Sustainable Futures, University of Technology, Sydney for the Australian Water Recycling Centre of Excellence.

Across the eight case studies, five key drivers emerged

Through interviews and analysis undertaken across the eight case studies in this project, we identified five common drivers for distributed recycled water schemes. These have been broadly defined as:

*(e.g. recycling to irrigate farms where there is no other water source, or recycling to process industrial waste where there are no other facilities)

The five drivers clearly reflect public or private concerns

Three of these drivers reflect a desire for public goods i.e. clean waterways, water security and "doing sustainability", while the other two, commercial enabler and direct commercial benefits, relate to private goods. In Figure 1, the case study schemes have been matched to the drivers. Some schemes appear next to multiple drivers and often reflect the perspectives of different proponents. Where a driver applies to just one or two proponents, rather than to the scheme as a whole, the relevant proponents are indicated in brackets. Private proponents are shown in **bold**. It is clear from the diagram that there is a strong relationship between public drivers and public proponents and private drivers and private proponents. **This difference is important, as schemes driven by public good should be evaluated on different terms to those seeking private good.**

The ownership and management arrangements for distributed recycled water schemes are more diverse than for centralised schemes

During the millennium drought, major new water infrastructure was built in cities and towns around Australia. For the large city-scale desalination and water recycling schemes the trend has been for

Figure 1: Matching drivers to public and private proponents of recycled water schemes

KEY
PROPONENT-SPECIFIC DRIVERS ARE INDICATED BY SHOWING THE PROPONENTS IN BRACKETS. PRIVATE PROPONENTS ARE SHOWN IN **BOLD AND BLACK**

- WBW: WIDE BAY WATER (PUBLICLY OWNED UTILITY)
- SA WATER: SOUTH AUSTRALIAN WATER (PUBLICLY OWNED UTILITY)
- YVW: YARRA VALLEY WATER (PUBLICLY OWNED UTILITY)
- URLC: URBAN AND REGIONAL LAND CORPORATION (STATE LAND DEVELOPMENT AUTHORITY)
- CUB: CARLTON UNITED BREWERIES (PRIVATE COMPANY)
- WBWC: WILLUNGA BAY WATER CORPORATION (PRIVATELY OWNED UTILITY).

government to engage private providers using public-private partnerships. However, for the small to medium scale schemes there is much greater diversity in the mix of ownership and management of schemes.

Case study schemes show the full spectrum of public and private engagement – from entirely public to entirely private

Table 1 outlines the split of ownership and management between the public and private proponents for each of the case study schemes. The table forms a spectrum, where at the left-hand end, the scheme is entirely publicly funded, owned and operated and on the right-hand end, the scheme is entirely private. More complex schemes with diverse proponents/ stakeholders appear in the middle of the spectrum. This table highlights the diversity amongst these case studies and the different levels of complexity in the ownership and management arrangements. Only two of the schemes used public-private partnership contracts, with Rosehill adopting a Build-Own-Operate (BOO) arrangement and Wagga employing a Design-Build-Operate (DBO) arrangement.

Drivers for public good are prevalent across the spectrum

In Table 2, the drivers and customers have been added to the same spectrum presented in Table 1. In Table 2 it appears that drivers for public benefit are prevalent across the spectrum, with a mix of public and private drivers for schemes in the middle. This differs from the customer base, which is primarily private across all schemes.

Realised beneficiaries may differ or change over time

At the bottom of Table 2, the anticipated beneficiaries of each of the schemes are listed and beneath that, the current (or realised) beneficiaries are listed, as identified during the case studies for each scheme. For half of the case study schemes (Aurora, Wagga, Roseville and Rosehill), the anticipated and realised beneficiaries differed and in some cases may have changed over time.

At Wagga Wagga, the recycling scheme was driven by the need to reduce wastewater discharge to the Murrumbidgee River and the need to save on associated costs, including discharge fees. The local council managed to avoid major capital costs for treatment plant upgrades by recycling treated wastewater for farm irrigation. The farmer who receives the treated wastewater for free also saves on irrigation costs.

At Aurora, on the outskirts of Melbourne, the beneficiaries were intended to be a new residential community built beyond the reach of existing wastewater infrastructure and local public space within that development. However, due to shifting circumstances, technical problems and major delays in building the housing development, only private residences and the housing developer benefited from the scheme.

In the case of Wide Bay Water, the goal has always been to avoid discharge into Hervey Bay (a World Heritage estuary) and this remains a benefit to the public at a local and national level. However, the local public benefit is currently being called into question due to the high

Table 1: Public-private spectrum of ownership and management for eight case studies

KEY
PUBLIC ■ PRIVATE

	WIDE BAY WATER	AURORA	WAGGA	ROSEVILLE	WILLUNGA	ROSEHILL	DARLING QUARTER	YATALA
Initial proponents	Public utility	State land development authority	Local council	Private golf course	Private operator	Private utility	Private developer	Private industry
No. entities own/manage	1	1	2	2	2	2	3	1
Ownership treatment	Public utility	Public utility	Local council	Private golf course	Public utility	Private consortium	Private investor	Private industry
Ownership network				Private golf course	Private water utility			
Management treatment			Private operator	Local council				
Management network			Local council	Private golf course	Public utility		Private utility	
Retailing	Public utility	Public utility	Not required	Not required	Private water utility	Public utility	Private utility	Not required
Type			DBO			PPP		

operating costs of the scheme and changed priorities of the utility's management.

The importance of some drivers varies – Public water security changes over time

In the cases of Rosehill and Roseville, a major driver was a desire to contribute to public water security by reducing demand on the potable supply. Now that the drought has broken and major new potable infrastructure, including a desalination plant, has been built, this driver is not currently relevant. This means that until Sydney's water demand exceeds the supply from dams and the desalination plant combined, there is no benefit to public water security. Depending on medium-term climate patterns and the water security context, this driver can be either **strong and politically important** or a **non-issue.**

Table 2: Public-private spectrum including drivers and beneficiaries

KEY
PUBLIC ■ PRIVATE

	WIDE BAY WATER	AURORA	WAGGA	ROSEVILLE	WILLUNGA	ROSEHILL	DARLING QUARTER	YATALA
Initial proponents	Public utility	State land development authority	Local council	Private golf course	Private operator	Private utility	Private developer	Private industry
No. entities own/manage	1	1	2	2	2	2	3	1
Ownership treatment	Public utility	Public utility	Local council	Private golf course	Public utility	Private consortium	Private investor	Private industry
Ownership network				Private golf course	Private water utility			
				Local council				
Management treatment			Private operator	Private golf course	Public utility		Private utility	
Management network			Local council	Private golf course	Private water utility		Private building manager	
				Local council				
Retailing	Public utility	Public utility	Not required	Not required	Private water utility	Public utility	Private utility	Not required
Type			DBO			PPP		
Principal customers	Public utility	Private households	Private farm	Private golf course customers	Private irrigators	Private industry	Private commercial business	Private industry
	Private farms		Local council	Local public	Local council			
Drivers	Clean waterways	Doing sustainability	Clean waterways	Commercial enabler	Commercial enabler	Direct commercial benefits	Direct commercial benefits	Commercial enabler
		Commercial enabler	Doing sustainability	Public water security	Direct commercial benefits	Public water security	Doing sustainability	
				Doing sustainability	Clean waterways			
Beneficiaries (anticipated)	Local community	Residents	Local council	Private golf course	Private operator	Private consortium	Private investors	Private industry
	General public	Developer		Golf course users	Private irrigators	Private customers	Private utility	
	Cane farmers	Local public		Local oval users	General public	General public	Tenants	
				General public				
Beneficiaries (realised)	Local community	Residents	Private farm	Private golf course	Private operator	Private customers	Private investors	Private industry
	General public	Developer		Golf course users	Private irrigators		Private utility	
	Cane farmers		Local council	Local oval users	General public		Tenants	

Public drivers are different in nature to private drivers and can be more difficult to evaluate
As discussed, the significance of the driver for public water security is highly context dependent and can change over time. The driver to "do sustainability" could be subjective, depending on whether it is perceptions or actual outcomes that are most important. More detailed analysis on the life cycle impacts of recycled water schemes and comparison against the alternatives to water recycling would be required to examine success against this driver. On the other hand, the driver for clean waterways does not change over time and can be directly measured as an outcome.

Private drivers do not change over time and commercial imperatives mean that only those that succeed can continue
Because businesses must be profitable in order survive, in the private sector only schemes that make a profit can continue to operate. The driver to enable business operations (commercial enablers) or the driver to create a profitable water recycling business (direct commercial benefits) differ from the public drivers in that neither are subject to priorities shifting over time and success against these drivers is easily measured through financial analysis.

Recycled water is given away free where it is considered to be waste rather than a resource
In the example of Wagga Wagga, recognising the value of recycled water to the recipient as a resource may provide an opportunity to put a price on the recycled water product and recover some costs. In the case of Willunga, treated wastewater is supplied for free by SA Water to the private Willunga Bay Water Corporation (WBWC), in part because SA Water avoids wastewater discharge fees. The general public is also considered to benefit from this arrangement, as waterway health is improved by avoided wastewater discharge. On the other hand, WBWC has a forty-year contract with SA Water to receive this treated water for free and in that time, the value of this "wastewater" may shift and its value as a resource may increase.

Public water utilities provide certainty to private companies through long-term contracts
As mentioned, SA Water has signed a **forty-year** contract with WBWC to provide the corporation with treated wastewater at no cost. This provides certainty for WBWC, but little flexibility for the publicly owned SA Water if the value of the resource increases during that time. At Rosehill, Sydney Water bears the brunt of demand risk through a **twenty-year** take-or-pay contract with the private consortium producing recycled water. As the retailer, Sydney Water had to negotiate contracts directly with industrial customers. Due to the short-term nature of business planning, Sydney Water was only able to secure **five-year** contracts with the private industrial customers. In addition, Sydney Water bears the difference in cost between the recycled water price paid by industrial customers and the amount payable to the private consortium which produces the water. This arrangement places them in a position where they bear all of the demand risk.

More of the private drivers have been realised as benefits

Comparing the drivers and the beneficiaries in Table 2 appears to show that despite the mix of public and private drivers and proponents, ultimately, private drivers are more often realised than public ones. This is due to several factors:

- Due to changing contexts, the driver for public water security **cannot always** be realised.
- "Doing sustainability" is difficult to evaluate unless a specific evaluation is conducted.
- Achieving private objectives is a prerequisite for scheme operation, which means that private proponents manage risks to maximise the potential for profit.

These differences are highlighted in Figure 2, where the five key drivers have been colour coded. On the right hand side, the ticks indicate where scheme drivers have been realised as benefits to proponents and the comments highlight where outcomes are difficult to evaluate or where circumstances have shifted over time.

Schemes built for public benefit need to evaluate their success against the scheme drivers, which may not be assessable using cost-benefit analysis

Figure 2: The characteristics of drivers, proponents and their outcomes

Scheme proponents faced both calculable and uncertain risks

The key risks for all parties within these eight schemes were collated, along with the strategies that were used to mitigate the risks. These are shown in Table 3 with schemes listed in the same order as the public to private spectrum in Table 1. For some schemes, different classes of risks were present. These have been broadly classified as 'calculable risks' or 'uncertain risks'. Calculable risks tended to be technical risks associated with the plant, regulatory compliance risks or contractual risks. Uncertain risks are those that were fundamentally difficult to predict. These include climate variability, political change, market variability and changes in public perceptions.

The calculable risks that were identified for each case study are shown in the top half of Table 3 and the uncertain risks are shown in the bottom half. Those risks that were mitigated are shown in blue. Minor risks that were unmitigated are shown in green. The significant risks that were under-mitigated are shown in pink.

Public proponents took on the most uncertain and uncontrollable risks

Three of the schemes featured under-mitigated risks, the majority of which were classified as uncertain, or difficult to predict. Almost all of these uncertain, under-mitigated risks were borne by public proponents. At Rosehill, the plant was built with intentions of expanding the customer base. While Sydney Water bore the demand risk associated with foundation customers, the private consortium bore the future demand risk and uncertainty of obtaining new customers to enable scheme expansion.

Demand risk was less of a problem for the entirely private schemes

The two schemes at the private end of the spectrum, Yatala and Darling Quarter had no demand risk due to a captive customer base. Yatala provided water in-house and Darling Quarter has a captive market within the commercial building.

Demand risk was successfully managed by a 'build as needed' approach at Willunga

Willunga, a private agricultural scheme and Rosehill, a public-private industrial scheme faced similar uncertainty with regard to scheme uptake, but each scheme treated this risk differently. While proponents of the Rosehill scheme built a plant capable of supplying more than the contracted demand, the Willunga scheme only expanded to add each new customer as they were ready to join the scheme. This approach has had significant benefits for Willunga, while Rosehill faces another period of about 15 years where they are contracted to take-or-pay for recycled water, while their customer base is currently dwindling.

Table 3: The nature of risks for each case study

KEY
MITIGATED RISKS UNMITIGATED BUT MINOR RISKS UNDER-MITIGATED RISKS

WIDE BAY WATER	AURORA	WAGGA	ROSEVILLE	WILLUNGA	ROSEHILL	DARLING QUARTER	YATALA
CALCULABLE RISKS							
Standard technical risks – risks of plant or irrigation system malfunction– mitigated by qualified maintenance system	Technical risk – Plant functionality dependent on demand, slow rate of development meant risk was unmitigated	Compliance risk – lack of technical and risk management capacity – contracted Tenix through DBO	Technical risk – scheme functionality, low yield due to climate – would need to share with golf course, potable water is backup	Technical risk – quality issues would have higher consequence as scheme grows – mitigated by on-site filters at each recipient property	Standard technical risk – design, construction, operation – borne by Aquanet through PPP	Technical risks – influent quality, mechanical failure, malodour, corrosion of fittings – mitigated by monitoring and additions to treatment train	Standard technical risk – industrial plant already has good capacity in-house for process engineering
	Public perception risk – perceived inequity over irrigated areas during drought – provided irrigation water to council parks		Public health risk for toilet flushing – very low risk	Technical risks – blocked filters, power outages, mitigated by maintenance		Regulatory compliance risk – managed by subcontractors	Regulatory risk – recycling a low volume of on-site domestic wastewater in addition to process water. Decided to exclude it from influent
						Contractual risk – rising operating costs can't be passed on. Can be renegotiated in future.	
UNCERTAIN RISKS							
Environmental risks – soil salinisation, pests, fire, storm affecting plantations – mitigated by insurance, monitoring, management	Health risk – risk of post-occupancy cross connections in plumbing – mitigated by expensive audit process			Demand risk – unknown demand for recycled water – mitigated by staged 'as needed' approach to expansion	Demand risk – insufficient demand for supply capacity	Health risk – risk of post-occupancy cross-connections in plumbing – risk management plan drawn up between contractors	Public perception risk – brewery using recycled water – mitigated by not using scheme as a marketing instrument to the general consumers.
Climatic risks – long-term shift to wetter weather, less demand for irrigation	Market risk – development is delayed due to market changes				Public perception risk – resistance to recycled water limits uptake by new customers		Political and climatic risk – water restrictions, trade waste price hikes, delays in municipal plant upgrades – decided to built their own in-house plant
Regulatory risk – unplanned discharge due to wet weather and insufficient demand							
Public perception risk – public perceive reuse as waste of money							

Note also that Rosehill was subject to greater difficulties in public perception and was unlucky with some industrial customers shutting down their operations. Nevertheless, in the face of highly uncertain demand, an incremental approach to scheme expansion can greatly reduce this risk.

Technical risks should be history

Some of the older case study schemes, such as Hervey Bay, Wagga Wagga and Aurora faced significant uncertainty with regard to technical risks as plants were new and untested. The technical success of the more recent schemes suggests that the second generation of water recycling plants is here and that industry knowledge regarding design and management of schemes has developed to a sufficient level to mitigate against functionality issues.

Public proponents can mitigate for uncertain risks

Shared arrangements between public and private proponents do not necessarily entail an equal share of risk. Amongst the eight case studies, public proponents have taken on a disproportionate amount of the uncertain, difficult-to-predict risks. However, some of these risks can be mitigated by a more cautious approach of building infrastructure "just in time", rather than "just in case".

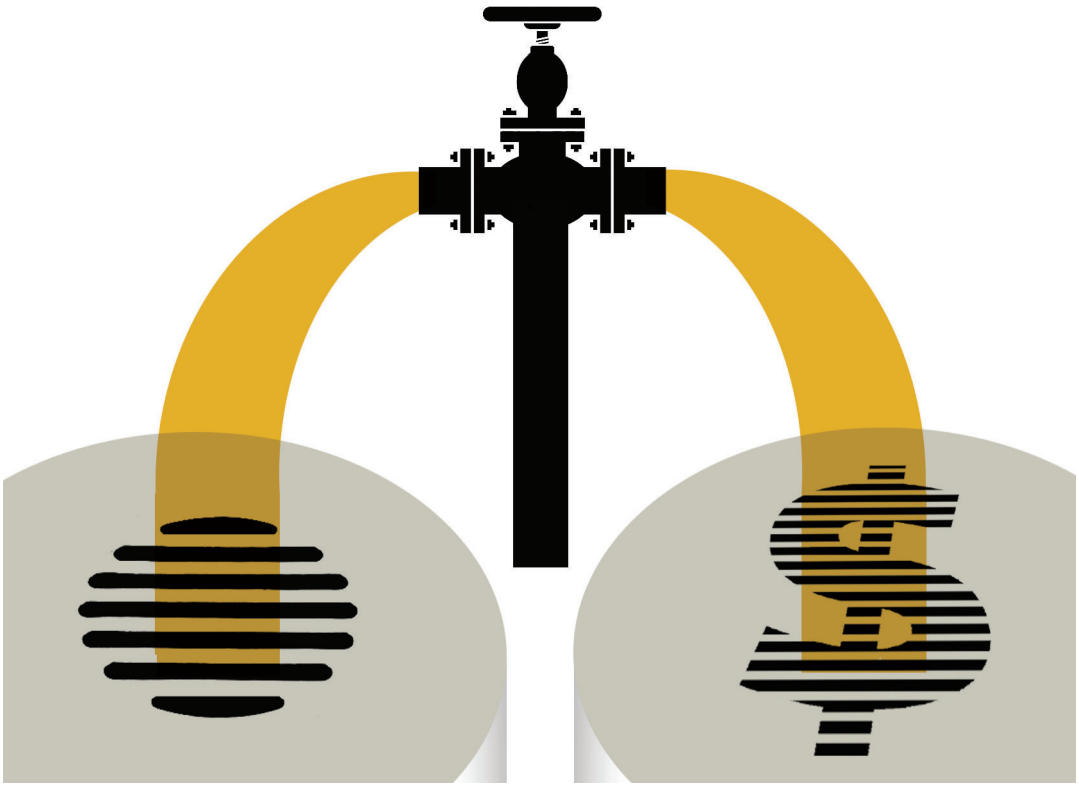
Public proponents need to be aware of the changing importance of drivers (e.g. public water security) and recognise where schemes entail uncertain risks (e.g. political or climatic risks). Losses can be minimised by using an incremental approach to scheme development, such that a scheme expands as information becomes available or as elements become more certain. Flexibility is key to being able to respond to uncertain risks and changing contexts.

A lack of experience combined with risk perceptions limits the uptake and price of recycled water

Wastewater recycling in the urban context is still a relatively young industry. There is a lack of experience in using recycled wastewater in all water-using sectors, from households to institutions to industrial users, with few exceptions. This lack of experience, and pervasive perceptions of public health risk, have hampered numerous wastewater recycling schemes to date. Concerns about the 'unknown' and about public health continue to limit acceptance and uptake of recycled water schemes and also limit the price people are willing to pay for recycled water, despite real financial benefits in some instances. These issues are compounded by the water security context. During drought, the risks of taking on a new water source became more acceptable, particularly for businesses where direct human use was not required. However, with full dams and a desalination plant in place, the drivers for taking on the risk associated with using recycled water are significantly reduced.

Opportunities to price recycled water according to its value need to be kept open

As experience with recycled water increases and the water security context shifts again, recycled water may be considered **not as a waste product, but as a resource** and scheme



proponents need to have the flexibility to recognise this shift and price water accordingly. Long-term contracts, in which treated wastewater is provided at a fixed price, need some flexibility to enable them to adjust pricing when the market for recycled water changes. Additionally, as beneficiaries may change over time, a flexible approach to pricing needs to be considered, such that beneficiaries contribute to scheme costs.

Summary

How who is involved influences outcomes

Across the eight water recycling schemes that were studied as part of this project, five key drivers for implementation were identified: 1) clean waterways, 2) "doing sustainability", 3) public water security, 4) commercial enabler or 5) direct commercial benefits. These drivers reflected either public or private concerns and matched their public or private scheme proponents.

The case study schemes had diverse ownership and management arrangements, which ranged from wholly public to wholly private, with many schemes involving a mix of public and private interests. The 'public' drivers, such as clean waterways, "doing sustainability" and public water security were prevalent across the full spectrum of ownership and management arrangements. Some of these public drivers, such as public water security, are contingent on circumstances that can and do change dramatically over time. In addition, 'public' drivers cannot be readily assessed in a cost-benefit analysis. These characteristics contrast with the private drivers, 'commercial enabler' or 'direct commercial benefits', which do not vary with time and can be readily assessed.

In some schemes, recycled water has historically been treated as 'waste' rather than a resource, and for this reason, public entities have engaged in long-term contracts where wastewater or recycled water is given away for free. As perceptions and value regarding recycled water are likely to change over time, opportunities to revisit and revise such positions should be kept open. Private drivers were more often realized as benefits, and this is likely due to the nature of commercial imperatives. Public proponents were more likely to take on uncertain and uncontrollable risks and to help provide certainty to private partners. However, uncertainty can be managed by public proponents adopting an incremental 'just in time' approach to infrastructure development, rather than a 'just in case' approach. This distinction is explored further in the 'Looking to the Future' theme.