



Queensland
Water Regional Alliance Program

April 2015

Reform of Water and Sewerage Utilities: Review of Sustainable Models

QWRAP Research Report 2

Reform of Water and Sewerage Utilities: Review of Sustainable Models

QWRAP Project: Research Report
Document Number 2
Document Type: Final Report
Revision: 3.2
Date: May 2015
Author: Rob Fearon, *qldwater*

© Copyright 2015 Local Government Association of Queensland (LGAQ).
Published by LGAQ and the Queensland Water Directorate, 25 Evelyn Street
Newstead, Queensland.

Document history and status

Revision	Date	Description	Author	Review
1.0	Jan 2015	Initial Draft	Rob Fearon	Arron Heatt
2.0	Mar 2015	Draft Report	Rob Fearon	Arron Heatt
3.1	April 2015	Consultation Draft	Rob Fearon	Simone Talbot, David Cameron.
3.2	May 2015	Final Report	Rob Fearon	Arron Heatt

Table of Contents

- Executive Summary 4
- Background 7
- 1 Structure of the urban water and sewerage sector: Diverse models 7
- 2 Case studies of structural reform within the sector 15
- 3 Analysis of common trends for institutional reform 19
 - 3.1 Private sector participation: Privatisation/ divestiture 20
 - 3.2 Private sector participation: Outsourcing 25
 - 3.3 Regional aggregation of local services 26
 - 3.4 Commercialisation and corporatisation 28
 - 3.5 Regulatory frameworks 29
 - 3.6 Identification of success factors 32
- 4 Implications for Queensland 32
 - 4.1 Relevance of models to regional Queensland 32
 - 4.2 Impact of global trends in regional Queensland 37
 - 4.2.1 Privatisation 37
 - 4.2.2 Outsourcing 37
 - 4.2.3 Commercialisation and corporatisation 39
 - 4.2.4 Regionalisation 40
 - 4.2.5 Regulation 42
- 5 Conclusions 43
- 6 References 46



Executive Summary

The Local Government Association of Queensland (LGAQ) and The Queensland Water Directorate (*qldwater*), along with elected representatives and staff from Councils, have been cooperating in developing regional collaboration in the Local Government water sector for several years. In 2011, the Queensland Water Regional Alliances Program (QWRAP) was developed as a council-led initiative to investigate alternative institutional models for urban water services in regional Queensland. QWRAP has received ongoing seed funding from the Queensland Government which has levered further investment from councils, LGAQ and *qldwater*. This report reviews urban water and sewerage delivery models from around the world and reviews case studies of reform to identify possible 'success factors' of enduring institutional structures and their relevance to regional Queensland.

Currently in Queensland, urban water and sewerage services (WSS) are provided predominantly by 68 local government Service Providers. In contrast, in other Australian jurisdictions corporatisation is common as is State/Territory Government ownership and regional-scale utilities. In 2011, three independent national reviews investigating the WSS sector across Australia each recommended reform for regional Queensland and country New South Wales, the two remaining areas where individual local governments are responsible for WSS.

Reform of local government WSS is a worldwide trend. In many countries WSS have been owned and managed by local governments since the 19th century but have been undergoing continual institutional restructuring which peaked in intensity in the 1990s and 2000s. A survey of all OECD and G20 countries shows that local government ownership, and in many cases management, remains the most common model for WSS but with a number of modifications from traditional council ownership and management.

Analysis of 21 case studies of reform revealed several common trends. Evolution of WSS models generally commenced with local government-only services transforming towards regional aggregation accompanied with increased commercialisation/corporatisation. Transfers of ownership to central (e.g. regional/national) government occurred in several jurisdictions but return of ownership back to local government was also common following failure of centralisation or privatisation. While full private ownership has seldom been successful, private sector participation via a diversity of outsourcing arrangements is universal and increasing in scale. Also on the rise was development of regulatory economic frameworks and performance monitoring to support and stabilise these arrangements. The universal nature of the trends and the stability of the resultant models suggested that these institutional arrangements are at least partial success factors in the WSS sector.

Private sector participation was considered in terms of both outsourcing/partnerships and the most extreme form of privatisation with full divestiture of WSS assets. Full privatisation has been trialled in numerous jurisdictions over the past three decades, but sustained success has been recorded in only a small number of cases (notably, in England, Wales and Chile). In many jurisdictions, privatisation has been rejected or the responsibility for WSS returned to local government after the failure of the private model. It is probable that privatisation itself was not responsible for these failures as it has often been employed as a

'last resort' in an already unstable industry condition. Nevertheless, privatisation is clearly a risky alternative for WSS, was not recommended for Queensland by any of the national reviews of the sector, and is not considered to be an appropriate solution for regional Queensland.

In contrast, the benefits of **private sector participation** in the form of outsourcing are widely acknowledged although there is marked variation in the degree, length and type of contracting arrangements across and within jurisdictions. Private sector participation has been held to increase efficiency and productivity by using specialist suppliers for 'non-core activities' allowing local government to focus on strategic local needs. This is reflected in Australia where some activities (e.g. capital works) are usually outsourced while one to two thirds of operational expenditure is also outsourced by Australia's largest WSS utilities. Outsourcing in Queensland while not as extensive as elsewhere in Australia, has been increasing for some time. This trend is likely to continue, possibly necessitating a regulatory framework to protect the interests of local communities, WSS providers and private industry.

Even in the absence of private sector participation, **commercialisation and corporatisation** of local government WSS has been argued to improve transparency, accountability and business management, providing some of the benefits espoused for private organisations while retaining ownership by the local community. Across Australia, corporatisation and commercialisation on a not-for-profit basis were implemented across the WSS sector as a result of 'competition reforms' of the 1990s. In Queensland, large local governments were required to adopt commercial practices and arms-length political oversight but some of these changes were effectively reversed following local government amalgamations in 2008. Elsewhere in Australia and in SEQ, corporatisation particularly in the form of statutory authorities, is the principal model for WSS. Commercialisation and corporatisation (at regional scales) were recommendations common to the reviews by Infrastructure Australia and The Productivity Commission.

Regional aggregation of local government WSS has become increasingly adopted both in Australia and internationally and the benefits of economies of scale in the WSS sector have been well established. Aggregation of Queensland WSS was recommended by all three national reviews but is complicated in Queensland by vast catchments, highly dispersed communities and economies of scale that can be achieved only at the expense of economies of density and scope. Successful regional approaches in other jurisdictions have generally been achieved over smaller areas with denser aggregations of population: the entire state of Victoria (where regionalisation has been highly successful) is only just over half the area of Queensland's first regional alliance in Western Queensland. Regionalisation in Queensland must be considered carefully along with a range of external environmental factors that are critical drivers for the industry.

The final 'success factor' identified from other jurisdictions was the presence of **broad economic regulation** of the WSS sector. Regulatory and economic frameworks have been shown to have a large impact on the efficiency of WSS in many studies and are common in other Australian jurisdictions. Queensland currently lacks such a framework in regional Queensland and regulation in South-East Queensland focusses solely on avoiding monopoly

pricing of WSS and is not yet mature. The recent introduction of a state-wide performance reporting framework by the state government represents a positive step towards broader, transparent economic regulation through performance benchmarking.

Determining whether these general trends represent possible 'success factors' for Queensland WSS is difficult. While there are a large number of academic studies benchmarking the efficiency of different models, they are hampered by data availability and results have been mixed. General trends suggest that larger, corporatised entities (such as the Victorian utilities) perform better on average than local governments, but that some local governments rank well regardless of size. A range of external factors also have a strong influence. As might be expected, the recommendations of the national reviews for regional Queensland closely reflect the trends (or success factors) identified for the WSS sector globally but each also reflected on the need to consider the external drivers in a large and diverse State like Queensland.

A particularly important factor is the large number of small isolated communities. In regional Queensland, two thirds of potable schemes service towns with fewer than 1000 residents, and 50% service fewer than 500 people. Economic models can overlook these small towns, but they are often important as drivers of reform because their lack of capacity and small rate base challenges their sustainability putting pressure on Local Government WSS and reflecting on the industry more broadly. Indeed, a tacit rationale for regionalisation of WSS is to incorporate small communities within larger organisations to cross-subsidise the cost-to-serve and to spread risk. Unfortunately, the costs to sustain small isolated WSS remain high regardless of the model adopted and often exceed the value of even the most optimistic projections for efficiency improvement. Regionalisation is thus an important but only partial solution for such communities regardless of ownership model. Supporting the large and dispersed urban population in a large state like Queensland is possible only through joint local and state government action.

Summary: Common features and trends identified for WSS internationally including local government ownership, regionalisation, corporatisation/ commercialisation, strategic private sector participation and economic regulation are associated with enduring and successful WSS models in many jurisdictions. These 'success factors' are interdependent and also subject to a range of additional external, and often uncontrollable, environmental pressures. Each of the trends noted on other jurisdictions is relevant to Queensland and the learnings from sectors that have already faced significant change provide useful insights for the future of the sector. This report reviews these trends and their potential implications for regional Queensland to provide information for QWRAP regions that are developing regional models.

Background

The Local Government Association of Queensland (LGAQ) and *qldwater*, along with elected representatives and staff from numerous Councils, have been cooperating in developing regional collaboration in the Local Government water sector for several years. In Queensland, urban water and sewerage services are predominantly provided by 68 councils and three council-owned entities maintaining over 350 town services. Around 88% have potable water supplies and 60% are sewered.

In 2011, the Queensland Water Regional Alliances Program (QWRAP) was developed as an industry-led initiative to investigate alternative institutional models for urban water and sewerage services (WSS) in regional Queensland. The program received seed funding from the State Government and this report is part of a series of deliverables to the Department of Energy and Water Supply forming the investigation of optimal models for regional reform.

This report examines case studies of reform of urban water and sewerage services in Australia and internationally to identify ‘success factors’ of enduring models within the sector and their relevance to Queensland.

1 Structure of the urban water and sewerage sector: Diverse models

Queensland local governments have had the lead responsibility for providing urban WSS to communities since their formation in the late 1800s. Historically, most Australian states and territories had a similar approach (McKay, 2002), but other jurisdictions have since adopted alternative models for WSS, with a trend towards state-level ownership and horizontal aggregation and corporatisation of services (see Fearon, 2012). In 2011, three national reviews of Australian WSS were published recommending restructuring local government services in Queensland, each suggesting some form of regionalisation, commercialisation and more integrated regulation (AECOM, 2010; NWC, 2011a; PC, 2011a). If implemented, the recommended reforms would remove responsibility for WSS from individual local governments.

The Queensland situation is not unusual internationally. In most western countries WSS have been owned and managed by local governments since the mid to late 19th Century (Braadbaart, 2009; Seppala and Katko, 2009; Sørensen, 2010) but have been undergoing a period of significant change since the 1980s (see e.g. Juuti and Katko, 2005; Rudolph *et al.*, 2007; Filippini, 2008; Barraque, 2009; Singh, 2011; Massarutto *et al.*, 2013; Estache and Saussier, 2014; Haider *et al.*, 2014a). Some countries “have progressively evolved very different approaches to providing urban water services, especially in the mix of privately and publicly owned entities and the extent of regulatory intervention to govern pricing and standards” (Worthington and Higgs, 2014, p. 52).

The global diversity of WSS models indicates that there is no single “best practice” approach and indeed, there is significant debate as to the ideal structure for the WSS sector. To explore this diversity and determine the features common to successful models, a survey of WSS structures was undertaken (see Table 1) examining member nations of the Organisation for Economic Cooperation and Development (OECD) and the ‘Group of Twenty’ (G20). Despite wide diversity among the jurisdictions, several recurring themes were clear.

An overarching finding was that significant restructuring and experimentation with alternative models has occurred across the WSS sector particularly in the past twenty years. This trend is explored more fully in Section 2. Despite significant restructuring of WSS there is a prevalence of local government ownership, and often management, in OECD and G20 countries. This includes several jurisdictions where centralisation and privatisation have been trialled and subsequently reversed. However, while local government ownership dominates, reform has commonly resulted in different structures for the governance and management of local government-owned WSS.

Another theme was that, regardless of ownership model, outsourcing of some or all management functions to the private sector was wide-spread. Contracting aspects of WSS operations is virtually universal (e. g. capital design and development, IT, and maintenance are often outsourced) while delegating all management functions to private industry (e.g. via leases or concessions) is common in many jurisdictions. In contrast, full privatisation of WSS (i.e. divestiture of assets to the private sector) is rare. While privatisation has been successful in two or three jurisdictions, there are numerous cases where it has been trialled and failed or subsequently been reversed. Private sector participation is critical to WSS but the balance of private and public sector involvement varies markedly across and within jurisdictions.

Finally, economic regulation (e.g. a price setting framework often based on performance monitoring) is present in many jurisdictions though this appears to be a recent and developing area. There is significant variation in how regulation is achieved and the scale at which it is implemented (e.g. regional, national). In contrast, environmental and health regulation has been in place for many years and are virtually universal in all jurisdictions. Typically these aspects of regulation are administered by separate agencies with little integration.

The analysis of OECD and G20 jurisdictions provides a snapshot of the current composition of the sector and gives some insight into the evolution of WSS from primarily local government ownership and management. In order to better examine the reform process itself, Section 2 reviews the process of change in case studies of reform from selected jurisdictions.

Table 1: Survey of models for water and sewerage services in OECD and G-20 jurisdictions.

Country/ Jurisdiction	Type and number of utilities	Ownership	Management	Other outsourcing	Regulation Economic	Regulation Quality & Environment	Sources
Argentina	Over 1000 providers at provincial, local and national levels (plus many cooperatives).	Public (some private)	Significant outsourcing to private and public companies.	Significant private concessions in the 1990s were reversed in some cases following national economic crisis in 2001	Yes (14 of 23 provinces have a regulatory agency as well as a federal regulator)	Yes (two agencies in each of 15 provinces)	Foster, 2005; Almansí <i>et al.</i> , 2010
Australia-NT	1 state-owned corporation	Public (State/Territory)	Public (Territory scale 'Power and Water')		Yes ('Utilities Commission of the NT')	Yes (Territory Legislation)	PC, 2011a; Fearon 2012
Australia-Queensland	70 LG and 2 regional (owned by LG)	Public (LG)	Primarily local government public service providers.		No (except SEQ by the 'Qld Competition Authority')	Yes (5 State agencies)	PC, 2011a; Fearon 2012
Australia-NSW		Public (LG and State)	Public (local and state government owners)	Significant outsourcing in metro areas (PC, 2011), particularly in Sydney Water where activities have been increasingly outsourced over the past two decades (PC, 2011)	Yes ('IPART' or councils (in country NSW))	Yes (2 state agencies)	PC, 2011a; Fearon 2012
Australia-ACT	1 ACTEW Water (now called Icon Water) is publicly owned	Public	Public (Territory scale, "Icon Water")	Part private ownership by ACL was recently reacquired but ACTEW and is now a fully public corporation	Yes ('Independent Competition and Regulation Commission')	Yes (2 Territory agencies)	ACTEW Water, 2015,
Australia-Victoria	17 state-owned corporations	Public (State)	Public (State owned corporations)	Significant outsourcing in metro areas (PC, 2011)	Yes ('Essential Services Commission')	Yes (2 state agencies)	http://www.water.vic.gov.au/governance . Byrnes <i>et al.</i> , 2009; PC, 2011a; Fearon 2012
Australia-Tasmania	1 LG-owned corporation	Public (LG)	Public (State-scale - TasWater)	Outsourcing of some non-core activities	Yes – 'OTTER' under State legislation (OTTER, 2011)	Yes State Legislation (3 agencies)	PC, 2011a; Fearon 2012; DTF, 2014
Australia-SA	1 state-owned corporation	Public (State/Territory)	Public with leasing of metro area to private industry	Services to the metro area are outsourced to a private consortium through 10-15 year contracts	Yes – 'Essential Services Commission'	Yes State Legislation (3 agencies)	PC, 2011a; Fearon 2012
Australia-WA	3 (Water Corp serves most communities)	Public (State/Territory, LG)	Public with metro area outsourced to a private consortium. Local government assistance in small and remote communities		Yes – Minister with advice from 'Economic Regulation Authority'	Yes (2 state agencies)	PC, 2011a; Fearon 2012
Austria	Over 5500 companies (community facilities, district water boards, cooperatives)	Public (LG)	Public (100%)		Yes	Yes National and EU	OECD, 2004, Gonzalez-Gomez <i>et al.</i> , 2014; AFMAFEWM, 2015

Belgium (Brussels and Walloon regions)	Sub-regional and LG (majority delegated by nearly 300 LGs to regional and joint LG utilities)	Public and Private	Public and Private			Yes Regional, National and EU	Varone and Aubin, 2002
Belgium – Flanders Region	Over 300 Flemish LGs delegate management to sub-regional, LG-owned companies	Public (LG)	Public (100%)	In 1990, a regional sewerage company was established with 49.9% privately owned. In 2006 this was re-acquired by councils and is now 100% publically owned		Yes Regional, National and EU	Varone and Aubin, 2002
Brazil	26 regional entities	Public (State-level)	Public (most)	Some examples of joint local government concession contracts	Yes – state level	Yes for sanitation (but recent – 2007)	Foster, 2005; Heller, 2009
Canada	4000 councils and 9000 schemes	Public	Public (2,500 schemes, or nearly 90% of the population being urban areas serviced by infrastructure owned and operated by municipalities)	Some councils outsource services to public or private companies. “The desire to experiment with the introduction of various forms of private sector and not-for-profit partnerships has increased and the changing public perception resulting from the effects of high-profile failures of government to ensure the quality of the water supply and sanitation” (Rosenberg, 2009, p. 258)	Yes Provincial/territorial		Rosenberg, 2009
Chile	Private companies (13)	Private	Private	Water industry decentralised from a single national entity to 13 private concessions based on the existing 11 regional areas	Yes (National Regulatory enforces tariff recovery)	Yes (two national agencies)	Fraser, 2005; Rouse, 2009
China	Regional organisations/	Public (minority private stockholders in some areas)	Public and Private (Corporatised)	Increasing amount of DBT contracts with private industry. China is the one country where privatisation is still increasing (Swyngedouw, 2009)	Yes - national	Yes (national and regional)	Zuo <i>et al.</i> , 2009; Rouse, 2009
Czech Republic	Numerous LGs	Public and Private	Public and Private	Extensive mixed PPPs (2nd largest in OECD). Extensive privatisation of water in the 1990s, mainly through joint ventures between municipalities and multinationals	Yes - national	Yes (national and EU)	OECD 2004 Hall <i>et al.</i> , 2004; Gonzalez-Gomez <i>et al.</i> , 2014
Denmark	325 (227/98) including 98 LGs plus around 2000 small user-owned utilities supplying 5.5 million people.	Public (LG)	Public (Corporatisation (non-profit) is mandatory).	Outsourcing of operational activities through competitive bidding on (typically) 3-year contracts	Central incentive-based price regulation	Yes (national and EU)	Pietila <i>et al.</i> , 2009
Estonia	200 companies cover 226 councils	Public (LG)	Public limited companies (profit-oriented)	10% of (smaller) communities serviced by mixed, or privately-owned companies or directly by councils	Yes - Emerging	Yes (national and EU)	Peda <i>et al.</i> , 2013
Finland	Municipal	Public (LG)	Public	The municipality of Haapavesi let a	Yes, national (cost	Yes three national	Sources: Vinnari &

				12-year concession in 2002. Outsourcing of operational activities is common > 50% and for capital investment is close to 100%	recovery)	Ministries along with state regional governments	Näsi, 2008; Pietila <i>et al.</i> , 2009; Hukka and Katko, 2009, Watertime, 2005
France	Many thousands of local authorities (communes, regions and departments) serviced by numerous entities. Increasing regionalisation since 1999	Public (Private funding accounts for around 12% of investment with rural services subsidised by government)	Over 75% of the population is serviced through delegated management to public or private companies	Extensive mixed PPPs (largest in OECD). Sewerage is less commonly delegated than water services	No , but 20% of utilities (by population) are large and have mandatory cost recovery		Sangare and Larrue, 2004; Pezon, 2009; Oelmann and Czichy (2013)
Germany	Over 6000 Inter-municipal/ municipal/ regional utilities. "There is a clear north-south divide in Germany, as small water utilities prevail in the southern part of Germany whereas the water utilities in the northern part service more water consumers" (KPS, 2009)	Public (LG)	Public and Private (30%)	Water services often delegated to a city utility. Management of around a third of services are outsourced to private companies. In the capital - 49.9% of Berlinwasser is privately owned	Federal and Regional oversight varies based on voluntary benchmarking	Yes (national and EU)	Rudolph <i>et al.</i> , 2007; KPS, 2009; Oelmann and Czichy (2013)
Greece		Public (LG)	Public (100%)			Yes (national and EU)	OECD 2004, Gonzalez-Gomez <i>et al.</i> , 2014
Hungary		Public (state-owned municipal companies)	Public and Private	Bucharest services were privatised in 2000 (OECD, 2003)		Yes (national and EU)	OECD 2004; Jutti & Katko, 2005; Dietrich <i>et al.</i> , 2013; Gonzalez-Gomez <i>et al.</i> , 2014
Iceland	79 LGs (2007) with increasing collaboration	Public (LG)	Public	Outsourcing of non-core activities through competitive bidding (typically 3-year) contracts			Pietila <i>et al.</i> , 2009
India	Numerous local and state/territory governments	Public	Public	Services are supplied by a mix of local and state governments and specialised public water utilities	No	Yes, but not universally observed	Singh <i>et al.</i> , 2011
Indonesia	Numerous (>300) water supply companies	Public (LG)	Public (some private sector involvement)	"In the water supply sector, 14 PSPs are ongoing" (ADB, 2013)	No (Guidelines only)	Yes - 4 national Ministries but needs strengthening (ADB, 2013).	TWD, 2009; ADB, 2013
Ireland	1 (952 public supplies)	Public (National)	Public (100%)		Yes	Yes	PWC, 2011b, Irish Government, 2014, DECLG 2012, 2013
Italy	94 "Optimal Territory Areas"	Public (regional)	Public and Private	Mixed PPPs are also common	Yes (national)	Yes (national and EU)	Pazi <i>et al.</i> , 2013; Massarutto <i>et al.</i> , 2013, Gonzalez-Gomez <i>et al.</i> , 2014
Japan	>5000 entities managing over	Public (LG)	Public (LG-owned)	Water utilities are mostly	No set by council	Yes (4 national	JWWA 2014; Marques

	15,000 'waterworks' most providing to populations < 5000		companies or councils)	commercialised but sewerage is managed primarily by local governments	utility.	Ministries)	<i>et al.</i> , 2014; MHLW, 2015
Lithuania	45 municipal companies (& >700 smaller enterprises)	Public (LG)	Public (joint stock companies)	Some attempts at privatisation have been rebuffed in the past (e.g. Vilnius in 1998)	Yes through legislation and a national Commission	Yes – three national regulators	Watertime, 2005
Luxembourg		Public	Public (100%)			Yes (national and EU)	OECD, 2004, Gonzalez-Gomez <i>et al.</i> , 2014
Mexico	Numerous city utilities and small cooperatives	Public (LG and provincial)	Public primarily	Limited service contracts a small number of long-term concessions and a single council owned company (privatisation is being driven by the World Bank)	Yes but not effective	Yes but not effective	Torregrosa Armentia and Jimenez Cisneros, 2009.
Netherlands	500 councils own 10 corporatised water utilities and 25 sewerage boards	Public (LG)	Public - LG-owned companies required to use private-sector accountancy rules.	In 2002 the first PPP in the Dutch water sector, for wastewater treatment, was signed with the Water Board of Delfland	Industry-led mandatory benchmarking	Yes (national and EU)	Kuks, 2004; Rouse, 2009; Delmann and Czichy (2013)
New Zealand	City and District LGs (around 40 serve over 10,000 people)	Public (LG)	Public (LG)	Mixed levels of outsourcing across councils and regional councils	No	Yes National	Fearon, 2012
Norway	431 LGs (2007) with increasing collaboration	Public (LG)	Public	Outsourcing of operational activities is common through competitive bidding (typically 3-year) contracts		Yes National and EU	Pietila <i>et al.</i> , 2009
Poland		Public (LG)	Public (100%)	Mostly council-owned commercial law companies. Some cities have privatised services	No –prices set every year by councils	Yes (national and EU)	OECD, 2004; Watertime, 2005; Gonzalez-Gomez <i>et al.</i> , 2014
Portugal	Over 3000 LG and regional services + 1 national corp providing bulk water and sewage treatment	Public (LG and national)	Public and Private	Mixed PPPs including concessions and private management		Water quality reporting.	OECD 2004, Gonzalez-Gomez <i>et al.</i> , 2014
The Slovak Republic		Public	Public and Private	Privatisation of some water supplies.	No	Yes (National and Regional and EU)	Kris, 2003; Kris and Skultetyova, 2009
Slovenia	192 LGs serviced by a smaller number of utilities.	Public (LG)	Public (handful of private companies/ concessions)		Yes (recent)	Yes (National)	
Sth Africa - Johannesburg	1 LG-owned corporation.	Public (LG)	Public				
Saudi Arabia	1 national utility (gradually privatising large cities)	Public (national government)	Public with increasing privatisation of large cities.	Work through management contracts with large international; companies and consortia.	Yes (but rates set below cost recovery)		Ouda <i>et al.</i> , 2014
South Korea	Seven regional utilities	Public	Public/Private	"Private sector involvement and funding in the construction of water treatment facilities was permitted in 1994. This has been extended to	No	Yes (National)	Global Water Intelligence, 2015

				allow BOT contracts, including foreign companies if they work in partnership with Korean companies. [...] Water treatment plants built by Degrémont account for 20% of drinking water in Seoul and 80% of Busan's"			
Spain	325 groupings of 8100 LGs	Public (LG)	Public and Private By 2000, 49% of councils were served by a private company, 32% by public companies, 12 % by PPPs and the rest by private consortia.	23% councils in mixed PPPs including local/regional concessions to two major companies (3rd largest in OECD). Sewerage is less commonly delegated to private interests	No	Yes (2 national departments with mandatory benchmarking but poor compliance) Yes and EU	Sauri et al., 2009, Gonzalez-Gomez et al., 2014
Sweden	290 LGs	Public (LG)	Public	A 10-year concession (Norrstalje) in 2002 and privatisation in Norrköping in 1997 which was reacquired by the municipality in 2005. Outsourcing of operational activities to private enterprise is common		Yes (national and EU)	Pietila et al., 2009
Russia	Numerous LGs and some regional (sub-national) structures	Public (LG and national in some regions)	Public and Private Responsibility delegated to 'unitary enterprises' "a particular kind of proprietary right which does not exist in Western law" (OECD, 2006)	Some large systems are managed by private industry (both international companies and local businesses public and private established by LG owners)	No	National	OECD, 2006
Switzerland	Numerous LGs	Public (LG)	Public (usually LG)		No (but have a "price supervisor" which recommends prices)	Yes – national (Federal) and EU	Mauch and Reynard, 2004; Faust and Baranzini, 2014
Turkey	Over 2000 LGs	Public (LG)	Public (LG) LG-owned companies in larger cities	Private operation of some treatment plants.	No	Yes (national)	
UK/England	18 Private companies	Private	Private (100%)		Yes. Ofwat (national) sets prices based on benchmarking	Yes (national and EU)	Oelmann and Czichy (2013)
UK /Wales	3 private companies	Private	Private (100%)		Yes. Ofwat (national) sets prices based on benchmarking.	Yes (national and EU)	Oelmann and Czichy (2013)

UK /Scotland	1 national utility	Public (Central Government)	Public	50% PPPs for Capital works. The majority of operations are delivered in house but PPPs and outsourcing are used extensively. Scottish Water developed joint ventures with United Utilities and other partners (Scottish Water Solutions) to deliver capital programs using external expertise, while also retaining staff required to manage and deliver its major capital investment program. Up to 50% of waste water services are outsourced through contracts with third-party providers	Yes (Water Industry Commission for Scotland)	Yes (WICS and The Drinking Water Quality Regulator) and EU.	Scottish Government 2008, Scottish Water, 2009, 2010, DWQR, 2004, 2005,2007, 2014, PWC, 2011b, WICS 2014, 2015.
UK /N. Ireland	1 national utility	Public (Central Government)			Yes	Yes - (national and EU).	
USA	Inter-municipal/ LG/ regional. In most metro areas with populations greater than 100,000 people (nearly half of the population or 130 million people) services are provided by city or regional water and sanitation utilities and 8% of the community water systems service over 82% of the population (USEPA, 2010)	Public (>90% LG) Private – 8.6% by volume (only 22% of these are 'for-profit')	Public and private	In regional areas most utilities are publically owned by local government or by utility cooperatives jointly owned by customers including local governments	Mixed	Yes (USEPA – national)	Uddameri and Singh, 2012, Beecher and Kalmbach, 2013, USEPA, 2009, 2010).

2 Case studies of structural reform within the sector.

Analysis of the factors determining success of different WSS models is hampered by the diversity of approaches and the significant change across the sector in recent decades. Overlain on this complexity is the tendency for each jurisdiction to criticise previous models while vigorously promoting expected benefits of a reformed system. Common reversals in WSS arrangements belie claims of an optimal state which may merely reflect contemporary political and public expectations. The aim of this section is to highlight the common elements and drivers of reform and identify factors associated with enduring model on the assumption that sustainability will often be correlated with success.

The case studies (Table 2) illustrate that although reform of the sector is not unusual, a period of intensive change commenced in the 1990s. In Australia “this era gave rise to perhaps the most dramatic period of reform in the urban water sector” when national competition reforms were enacted (Byrnes, 2013, p. 16). Substantial restructures occurred in Victoria and other states while in Queensland, a mandatory ‘commercial framework’ was applied to larger council providers and Wide Bay Water Corporation was created as a council-owned corporation. Globally, significant change occurred in many jurisdictions as policy makers sought to optimise models of ownership, management and overarching governance. The pace of reform has now declined as evidenced in Australia by the closure of the National Water Commission and abolition of the Council of Australian Government’s (COAG) Standing Council on the Environment and Water (Lehane, 2015). Internationally, reform has slowed too although there is an increased focus on underdeveloped countries driven in part by international funding organisations (see Braadbaart, 2009).

It would appear however that drivers of reform still persist in most jurisdictions suggesting that change will continue. The most common driver identified across all jurisdictions was a need to overcome financial difficulties and in particular, to allow greater investment in essential infrastructure (Table 2). Consequently, the aim for many jurisdictions was to achieve savings from economies of scale or provide access to private financing (e.g. in the ACT, Belgium, England, Ireland, Italy, Scotland, SEQ, Spain, Victoria, and Wales). Other common drivers were the need for improved service standards or to extend services into regional areas (e.g. Argentina, Estonia, Ireland, Italy, Lithuania, Northern Ireland, Saudi Arabia and Tasmania) and to improve general efficiency (e.g. Denmark, Finland, France and the Netherlands and Scotland). These drivers reflect the conflict between the needs of ongoing investment in WSS and the constant customer political pressures to reduce bills. The degree to which current arrangements in each jurisdiction find the right balance for sustainable investment will determine the future of reform in the sector.

The trend for divestiture of public WSS utilities to the private sector common in the 1990s and 2000s was in part a response to the need for greater investment. The call to privatise local government WSS was strong in many jurisdictions (e.g. in Argentina, Denmark, Finland, Netherlands, and Spain) and still continues in some developing countries (McDonald, 2013). However, there are a troubling number of cases where reforms were enacted then later reversed, and there are few ongoing examples of successful privatisation (namely England, Wales and Chile) while divestiture has been considered and actively rejected in other

countries (e.g. Denmark, Ireland the Netherlands, Scotland and the USA). Indeed there is an ongoing and acrimonious debate in the literature regarding the benefits of private versus local government ownership. This debate and the comparative strengths of the two models are examined in Section 3.1.

In contrast, outsourcing by public utilities (ranging from contracting ‘non-core activities’ to delegating all management activities through concessions or leases) has tended to increase over the past three decades for a range of reasons. In Canada for example, private partnerships are being explored in order to improve safety and service standards (Rosenberg, 2009). In France, over a century of delegating management resulted in part from the desire of local authorities to maintain individual ownership of WSS (Barraque, 2009). One outcome has been the growth of French private utilities which subsequently have played a key role in privatisation in other countries. Another result, reiterated in jurisdictions such as Spain, Portugal and the Czech Republic, has been increased regional aggregation of services driven by joint leases or concessions by neighbouring local governments (see Hall *et al.*, 2004; Sauri *et al.*, 2009; Gonzalez-Gomez *et al.*, 2014). However, even in jurisdictions with traditional public sector management the proportion of activities contracted to the private sector has tended to increase over time and this is further examined in Section 3.2.

Regionalisation through horizontal aggregation of WSS has not only increased from joint outsourcing; it has been a common trend across many OECD and G20 countries regardless of ownership structure. This has occurred in some cases through active selection for models that can more readily maximise economies of scale (e.g. in Argentina, Auckland, Brazil, Ireland, Italy, Lithuania, England, Scotland, and Wales) while in other jurisdictions it has evolved through rationalisation of, and collaboration among, neighbouring local government WSS (e.g. in Denmark, Finland, Flanders, SEQ, Spain, Tasmania and Victoria). Interestingly, sewerage services sometimes remain the responsibility of local government even following regionalisation. Amalgamation of local governments has also occurred in a number of jurisdictions, resulting in aggregation of WSS (e.g. Auckland, Denmark, England, Finland, Scotland, Queensland, and Victoria).

Some cases of regionalisation have been accompanied by a transfer of ownership from local to central control (i.e. national or state/regional government). This has occurred in e.g. Argentina, Brazil, Flanders, Ireland, Lithuania, Northern Ireland, Scotland and Victoria. However, “remunicipalisation” or a return to local government responsibility is now favoured in many jurisdictions including some of those that had previously centralised or privatised their services (e.g., Denmark, Estonia, Finland, Flanders, Italy, Lithuania, The Netherlands, and the USA)¹. The perceived benefits of local government ownership are examined further in Section 3.1 and regionalisation is discussed in Section 3.3.

There has also been a consistent trend for commercialisation or corporatisation of public WSS, often occurring in parallel with regionalisation or centralisation. Corporatisation is

¹ Decentralisation (to form regional utilities) has also occurred in Brazil, Chile, and Saudi Arabia though as part of broad-based Political and ideological changes.

virtually universal for utilities owned by State or national governments (e.g. Australia, Belgium, China, England and Wales (prior to privatisation), Northern Ireland, Saudi Arabia, and Scotland) and many jurisdictions have adopted commercial or corporate approaches for local government owners (see e.g. Denmark, Estonia, Flanders, Italy, Japan, Lithuania, the Netherlands, Poland, and Spain). As with regionalisation, in some cases where water supplies are commercialised, sewerage services remain the responsibility of local government. Corporatisation and commercialisation are sometimes viewed as providing efficiency and management benefits while maintaining public ownership and direct accountability through community representatives and are examined further in Section 3.4

The final common feature noted for most jurisdictions regardless of institutional models is the development of economic regulatory frameworks often incorporating performance reporting and rules to govern price setting and cost recovery (see Table 1). However, despite a tightening of regulation in many jurisdictions, there is seldom integration among the economic, environmental and licencing frameworks and each of these sometimes competing issues frequently fall within the portfolio of different government agencies. Moreover, the scale at which each agency acts varies from local to regional and national scales while in Europe, multi-national regulatory structures have become key drivers for the WSS sector. The trend for increased economic regulation and performance measurement are further examined in Section 3.5.

Table 2: Case studies of reform of water and sewerage services and the drivers for change. Unless noted specifically, sources are the same as those listed in Table 1 for each jurisdiction.

	Reforms implemented	Reasons for Change
Argentina	<p>1912 – Single national water utility created.</p> <p>1970s – Responsibility decentralised to provincial governments, a small number delegated responsibility to LGs.</p> <p>1990s - Further decentralisation and private concessions let by most provinces for up to 30 years.</p> <p>2003 – National government renegotiated private contracts and some firms withdrew.</p> <ul style="list-style-type: none"> - Private companies in Bueno Aires replaced by public capital companies at national and provincial levels (national government as guarantor). <p>2000s- LGs taking more responsibility.</p>	<ul style="list-style-type: none"> • Central government experiencing financial issues. • Need to extend services, particularly to poorer areas. • Private companies underestimated the needs of the network and were further destabilised by “Argentina’s economic crisis in 2001. • Increasing poverty and expense of services to the poor demands local solutions.
Auckland	<p>2010 - Six LG service providers and one bulk water entity merged into WaterCare.</p>	<ul style="list-style-type: none"> • “Clear scope for improved cooperation and coordination”. • to overcome the fragmented nature of the industry resulting in poor regional planning and decision-making.
Australia- ACT	<p>WSS originally provided by national public service then:</p> <p>1988 - Centralised (Government Authority).</p> <p>1995 - Corporatised (ACTEW Corporation Limited) with significant private investment.</p> <p>2012 - Returned to full public ownership (ACTEW Water).</p> <p>2015– Rebranding of ACTEW Water to “Icon Water” to avoid “continual confusion”.</p>	<ul style="list-style-type: none"> • Need for greater infrastructure investment. • Economies of scale.
Australia- QLD, South East Queensland	<p>2008 - Amalgamation from 17 to 10 LGs.</p> <ul style="list-style-type: none"> - Bulk water assets mandatorily transferred to four new state government entities. - Establishment of a single LG-owned authority. <p>2010 - Single utility mandatorily replaced with 3 sub-regional LG-owned utilities.</p> <p>2011 - Two of the new bulk entities merged.</p> <p>2012 - One LG authority reverts to three LG owners.</p>	<ul style="list-style-type: none"> • Rationalisation of complex arrangements. • Response to severe drought. • Need to invest in additional infrastructure.

	2013 - Remaining state bulk entities merged.	
Australia-Victoria	<p>1994 - WSS responsibilities and assets transferred from 120 water boards and LG to regional State ownership.</p> <ul style="list-style-type: none"> - Four Metropolitan and 17 state-owned regional urban water businesses. <p>2005 - Three regional entities merged in 2005 leaving 13 regional urban water utilities.</p>	<ul style="list-style-type: none"> • Scale economies and a more business-like structure. • “A nation-wide focus on microeconomic reform arising from the so-called ‘National Competition Policy’” Byrnes et al 2009, p. 155). • ‘Pay for use’ pricing. • “significant cuts in operating costs” Byrnes <i>et al.</i>, (2010, p. 441).
Belgium-Flanders	<p>Mid-late 1800s – Increasing regionalisation of LG services to water companies owned jointly by councils.</p> <p>1990 – Regional sewerage company established with 49.9% privately ownership.</p> <p>2006 - Company re-acquired by LGs to be 100% publically owned.</p>	<ul style="list-style-type: none"> • Need for greater infrastructure investment • Improved efficiency.
Brazil	<p>1964 - Military dictatorship centralised service from LG to 26 provincial states through concessions.</p> <p>1985 - Democratically elected government enhanced the power of LG (in legislation) but retained regional entities.</p> <p>1990s - More PPPs were initiated with LG ceding their “their constitutional right of service provision to the state authorities in return for an attractive investment financing package” Foster, 2005, p.5).</p> <p>2000s – Increasing fragmentation but aggregation of sanitation services.</p>	<ul style="list-style-type: none"> • “International influence in the development of contagious disease control, • transformations in the economic, political and social and cultural characteristics of the country, and • changes in the prevailing understanding of the role of the public sector.” (Heller, 2009, p. 335). • For sanitation, “not least because it is seen as a strategic lever of power at the local and regional level” (Heller, 2009, p. 336).
Denmark	<p>1970 - LG amalgamations (from 1386 to 275 councils).</p> <p>2007 –Amalgamations to 98 LGs (325 water companies).</p> <p>2009 - Mandatory corporatisation (non-profit, limited companies) and centralised benchmarking and further aggregation.</p>	<ul style="list-style-type: none"> • Comparison with improved efficiency after privatisation in England and Wales. • Increased efficiency through centralised price regulation and performance benchmarking. • “Liberalisation has been on the agenda for the last 10-15 years. However, the idea to liberalise the water sector has met political and technical obstacles” (Sorensen, 2010, p. 15).
Estonia	<p>1990s - Nationally-owned utilities were transferred to LG.</p> <p>1995 - Commercial Code transformed utilities to public limited companies owned by LG.</p> <p>2001 - Capital City (Tallinn) sold 50.4% of shares to international partners.</p> <p>2005 - Tallinn 30% of shares listed on local stock exchange</p> <p>2013 -10% of (smaller) communities serviced by mixed, or privately-owned companies or directly by LGs.</p>	<ul style="list-style-type: none"> • Need to meet EU directives on water quality.
Finland	<p>1950s - Amalgamation of LGs (547 to 416 by 2007).</p> <p>1980a - Increasing decentralisation to LGs.</p> <p>1990s - Increasing alliances and cooperation outsourcing.</p>	<ul style="list-style-type: none"> • Discussion of private involvement occurred in the 1990s but “has largely faded out – private companies have not actively pushed for the option, nor have the municipalities shown much interest in it” (Pietila <i>et al.</i>, 2009, p. 227).
France	<p>1800s- LGs delegate to private sector under a range of outsourcing/ concession contracts.</p> <p>1982- Decentralisation Act increased the number of delegated authorities from 50 to 75% (by population) over a few years.</p> <p>1999 - Increased cooperative regionalisation of LGs and communes due to change in legislation.</p>	<ul style="list-style-type: none"> • “Very small communes have long continued to resist government proposals for mergers” (Barraque, 2009, p. 239) necessitating joint approaches for outsourcing. • Legislative change in 1999 sought to increase efficiency through economies of scale.
Ireland	<p>2011 – 34 city and county LGs replaced by a single national corporation – Irish Water.</p>	<ul style="list-style-type: none"> • Significant under-investment in infrastructure. • Numerous customers on boil water notices. • 40% losses from leakage. • Lack of capacity in the capital Dublin. • 16% of our water supplies at risk (affecting over 1 million people). • One-third of sewage treatment plants failing to meet standards. • Only 15% of costs were borne directly by users (PWC 2011b, p. 10). • EU/IMF required transfer of responsibility for water services provision from the local authorities to a water utility. • Need to retain “the local touch”. • Comparison with England and Wales.

Italy	<p>1994 – Regulations mandated arms-length commercialisation.</p> <ul style="list-style-type: none"> - Around 13,000 providers prior to the change grouped into 94 regions. <p>2004 - Compulsory competitive tendering introduced.</p> <p>2011 - Public discontent led to a referendum resulting in abolished compulsory tendering, but mandate public ownership and ‘not-for-profit’ operations.</p>	<ul style="list-style-type: none"> • Need for asset investment. • Reduce reliance on government funding for capital (and sometimes operational) expenses. • Water quality and security issues. • Environmental failures from poor sewage treatment.
Lithuania	<p>1940s – LG water utilities were nationalised into 14 regional state companies when the country was annexed to the Soviet Union after WWII.</p> <p>1990 - Responsibility returned to LGs which formed 45 municipal water companies.</p>	<ul style="list-style-type: none"> • Independence from centralised control. • Initiating sewage treatment.
Netherlands	<p>1996 – Rejection of government plan to centralise regulation, increased corporatisation and outsourcing.</p> <p>2004 - Law requires household water to be provided by publically owned (LG) companies.</p>	<ul style="list-style-type: none"> • Seeking economies of scale efficiencies. • Rejection (by local government) of proposed centralisation in favour of industry-led reform.
Saudi Arabia	<p>2005 – National Water Company created to take gradual responsibility of WSS from state ministry.</p> <p>2008 - 2 largest cities transferred to NWC and 6-7 year management contracts signed with 2 companies/consortia.</p> <p>2010 - 2 further cities transferred.</p> <p>2011- 5 year management contract with a consortium.</p>	<ul style="list-style-type: none"> • Address previous problems of: shortage of water, high non-revenue water (30-40%), low collection rates, inefficiency, poor staff development and motivation, environmental issues, limited sewage collection, ageing infrastructure, incomplete data and customer dissatisfaction.
Spain	<p>1990s- Increased outsourcing mostly operational concessions versus LG-owned companies.</p> <p>2007- “Private participation in the urban water management in Spain is starting to be questioned. Therefore, reversals of some processes have taken place in Spain, making it possible for the public sector to regain management of the service” (Gonzalez-Gomez et al., 2014, p. 6).</p>	<ul style="list-style-type: none"> • “Need of local councils to capture new financial resources for their exhausted coffers, and • the growing interest of private capital in entering new areas previously insulated from the markets” (Sauri et al., p. 208).
UK- England and Wales	<p>1950s-1970s- Over 1000 water and/or sewerage utilities amalgamated to 198 local authorities.</p> <p>1973 - 10 regional (catchment-based) authorities created</p> <p>1989 - 21 private regional companies created and subject to efficiency regulation.</p>	<ul style="list-style-type: none"> • Expected efficiency improvements through performance reporting. • Increase private financing for infrastructure investment. • Increase competition by comparison.
UK- Northern Ireland	<p>1973 - All LG services transferred to central Government.</p> <p>2007 - Northern Ireland Water created.</p>	<ul style="list-style-type: none"> • Increased capital investment needed (high water losses, boil water alerts, capacity, failure to meet environmental standards). • Commence water charging.
UK- Scotland	<p>1968 - 210 boards and LG amalgamated to 13 water boards and 12 regional councils.</p> <p>1996 - Three central-government regional bodies created.</p> <p>2002 - Single publically-owned company.</p> <p>2008- Water and sewerage retail market established.</p>	<ul style="list-style-type: none"> • Increased capital investment needed. • Inefficiencies compared with England and Wales private sector. • Potential competition from southern companies.
USA	<p>“While the 1990s saw some efforts towards privatisation, the current trend appears to be towards re-municipalisation and private disinvestment” (Uddameri and Singh, 2009, p. 265).</p>	<p>Privatisation reduced because of</p> <ul style="list-style-type: none"> • the local nature of water resources. • the intimate connections between water services, public health, and local economic development. • the desire for local control of water monopolies and the prices they charge to constituents.

3 Analysis of common trends for institutional reform

The review of OECD and G20 countries showed that reform is common but there is no universally accepted best-practice model for WSS. Evolution of the sector typically commences with local government-only services and proceeds towards regional aggregation often accompanied with increased commercialisation and corporatisation. These changes may be accompanied with transfer of ownership to regional/national entities or to private industry, but reversals of ownership (i.e. back to local government) are also common. When

such reversals occur, the regional and commercial/corporate form has often been retained to form council controlled entities.

In parallel with these structural changes were trends for increasing private sector participation and for introduction of regulatory economic frameworks linked to performance monitoring. The universal nature of these trends and the long-term stability of models incorporating these structures suggest that they may be associated with successful WSS. Each is explored further below.

3.1 Private sector participation: Privatisation/ divestiture

Privatisation, defined here as the full divestiture of WSS utilities and assets to the private industry, has been trialled in numerous jurisdictions but has frequently been reversed and remains relatively rare in OECD and G20 countries (see Swyngedouw, 2009; Ouda *et al.*, 2014; Lobina *et al.*, 2014; Vidal, 2015). This is somewhat surprising given the potential benefits claimed for privatisation (Rouse, 2009; Oelmann and Czichy, 2013; Ouda *et al.*, 2014) which has resulted in a large body of research comparing efficiency of private versus public models (see review by Worthington, 2014). Indeed, “the key purpose of many urban water utility studies of efficiency has been to examine the role of ownership” (Worthington, 2010, p. 17). Somewhat surprisingly, these studies predominantly find no clear efficiency benefit from either private or public (local government) ownership (see reviews of Walter *et al.*, 2009; Worthington, 2010; Sorrenson, 2010 and recent studies in Estonia (Peda *et al.*, 2013), Spain (Cuadrado-Ballesteros *et al.* (2013) and Italy (Pazi *et al.*, 2013) and a conflicting report from Saudi Arabia (Ouda *et al.*, 2014).

The failure of privatisation to show detectable efficiency benefits is most inexplicable in those cases where private companies are in a position to ‘cherry-pick’ where to invest. For example, in Spain approximately half of WSS utilities are privatised and Gonzalez Gomez *et al.* (2014, p.3) report that a “private company will avoid managing the service in municipalities with lower projected profitability.” Despite this advantage, the comparative analysis showed no difference in efficiency based on ownership. Why has a model with such promise (and success in other sectors) failed to deliver for WSS except in isolated instances?

One possible explanation for some of the failures of privatisation of WSS is the context of reform. Gonzalez Gomez *et al.* (2014, p.5) noted that in most cases “the principal pragmatic factor in favour of privatisation is to relieve the financial burden on the municipal budget.” In a review of European WSS, Barraque (2012, p. 246) concluded:

too often, local authorities decided to privatise some urban infrastructure, hoping to get rid of a problem that was becoming too difficult or too costly on the back of private companies which would then take responsibility for rising prices. [...] In the end, this type of privatisation often fails because, rather than less, what was needed was more direct involvement of the local authority in defining and controlling the water supply service.

Similarly, Rouse (2009, p. 143) found “increases in water charges associated with private contracts” sometimes resulted from the concurrent removal of government subsidies or from chronic under-recovery of costs prior to the change (see also Devkar *et al.*, 2013). Further constraints can include “poor initial information about the condition of water

infrastructure, weak investment environments, high capital intensity, large initial outlays, long investment payback periods, and the high risk of fixed assets” along with the absence of “effective regulatory mechanisms” (Ouda *et al.*, 2014, p.109). It is likely that privatisation has failed in some cases because of the pre-existing dysfunctional frameworks and unrealistic expectations raised for systems that had fundamental problems.

Privatisation has been successful in England and Wales but has been maturing for three decades (Sørensen, 2010, PWC, 2011b) as well as in Chile (Fraser, 2005) and is currently being introduced progressively in Saudi Arabia (Ouda *et al.*, 2014) and China (Zuo *et al.*, 2009; Rouse, 2009). England and Wales have in fact become a default baseline for many other jurisdictions considering efficiency reforms. However, after closely reviewing the success in England and Wales, several jurisdictions have nonetheless rejected privatisation and instead pursued efficiencies through other mechanisms. These include centralisation in Scotland (Scottish Water, 2009) and Ireland (PWC, 2011b) and local government corporatisation in Denmark (Pietila *et al.*, 2009). In other cases, private ownership has been trialled but then reversed and services returned to local government management:

such a reversion has happened in municipalities in developed countries (such as Paris, Hannover, Atlanta, Berlin and Budapest), as well as in developing countries (Jakarta and Cochabamba), as a result of dissatisfaction with the private management company (Gonzalez-Gomez et al., 2014, p. 1-2)

Indeed even in an optimistic review of the recent initiation of WSS privatisation in four Saudi cities, Ouda *et al.* (2014) acknowledged “water-supply services worldwide experienced a wave of privatization over the last three decades, with majority of documented cases deemed failures.” Clearly despite strong performance in a small number of cases, privatisation of WSS has seldom been successful in the long term (see also Swyngedouw, 2009; Lobina *et al.*, 2014; Vidal, 2015).

One difficulty with private divestiture results from negative public perceptions. For example in Denmark, mandatory corporatisation in the last decade was intended to increase opportunities for eventual private ownership but following push-back from communities:

a bill was passed which stipulated that municipalities will have 40-60% of the proceeds from sales of water companies deducted from their block grants from the state” effectively eliminating privatisation (Sorensen, 2010, p. 36).

Community animosity for privatisation often focusses on the essential nature of local services and concern over prices. This is a common theme in Australia (see e.g. Strachan, 2012; ABC, 2014; ABC, 2015) but appears to be a widespread sentiment exemplified by the familiar public expectation that water supplies should be free. For example “many Spaniards do not think that a basic good such as water should be paid for” (Sauri, *et al.*, 2009, p. 216) and the recent introduction of water billing in Ireland has resulted in significant protests (see BBC, 2014). Such sentiments seldom rely on evidence-based comparison of private versus public ownership, possibly because customers are seldom consulted and informed prior to divestiture. Confusion is also generated by conflicting reports about potential benefits and threats. For instance, privatisation has been reported to successfully extend reliable and safe WSS to disadvantaged communities in some areas in Chile, China and Saudi Arabia (see Rouse, 2009; Ouda *et al.*, 2014) but other commentators have indicated a failure of private companies to service non-profitable zones of their service area (see e.g. Foster,

2005; Swyngedouw, 2009 and see The Guardian, 2015). Moreover, the common alternative to privatisation is local government management, a system well understood and often viewed with less distrust by the public.

Despite the failures of privatisation, it is clear that the limitations and constraints of local government WSS identified in the literature are widespread globally. A common problem identified for local government services is financial stability in the face of increasing public pressures and evolving regulatory environments. A customer's expectation of free WSS is often indicative of a failure of local government to communicate the true value and costs of these services while artificially maintaining low water bills. Both the financial sustainability as well as the effectiveness of local government water utilities have been questioned often (see reviews from Latin America (Foster, 2005), Nordic countries (Pietila *et al.*, 2009); Europe (Barraque, 2009; PWC, 2011b), and the United States (Beecher and Kalmbach, 2013). In a review of European WSS, Rouse (2009, p.139) suggested that "in principle, the municipal model for public services is ideal, [...but] the reality is very different, as there are a number of characteristics that can contribute to the inadequacy of municipal managed utility operations." As prime examples, the author cited:

- lack of separation between policy and delivery resulting in political interference,
- failure to recover costs meaning subsidies are required to top-up operational and capital budgets, and
- poor public sector pay making it difficult to attract the best people, lowering morale and increasing temptation for corrupt practices.

The author acknowledged some examples of successful local government utilities² but attributed these to adoption of internal contracting and public reporting of performance, systems which he claimed are fundamental to private utilities. In contrast to local government, it was argued that privatisation would "provide access to operational management with wider experience, and should lead to better definition of objectives and greater transparency" (Rouse, 2009, p. 149).

In opposition to the supporters of privatisation is a broad movement promoting local government ownership of WSS under the principle of subsidiarity, that is that WSS services should be the responsibility of the most immediate (or local) level capable of performing them effectively. Some of these commentators have attributed the promotion of privatisation of WSS in the past three decades to socio-political imperatives called variously "neoliberalism and microeconomic reform" (Byrnes 2013), "new public management" Cuadrado-Ballesteros, *et al.* (2013, p. 32), and "liberalisation" (Sørensen, 2010). Seppala and Katko (2009, p. 98) summarised the period as follows.

Since the 1980s, neo-liberal policy makers have reintroduced the privatisation of water and sewerage systems as an 'innovation' to solve the problems of WSS worldwide, which has been promoted particularly by international financial bodies and multinational companies [.....] almost three decades later, even representatives of the institutions that have been the main promoters of privatization, such as the World bank, have publically

² Rouse (2009) singles out Seattle (USA) and Brisbane Water (in 2006 prior to the 2007-13 restructures).

admitted that the expected outcomes, like the procuring of private financing for WSS, were never realised.

These commentators often support “capacity building by both local governments and utilities and the local private sector – instead of promoting the involvement of multinational private water companies not familiar with local conditions” (Hukka *et al.*, 2009, p. 160 and see Lonborg, 2005; Sørensen, 2010; PWC, 2011b; Cuadrado-Ballesteros *et al.*, 2013; Peda *et al.* 2013; Gonzalez-Gomez *et al.*, 2014). Some authors go further and support returning responsibility to local government or ‘remunicipalisation’ of WSS:

the concept of decentralisation is often seen as a universal good and is promoted worldwide. Proponents of decentralisation argue that it can lead to more efficient allocation and use of resources, i.e. the economic justification of this process is based on reasons of ‘allocative efficiency’ as well as the lowest level of government being considered to be able to perform functions more effectively. Furthermore, decentralisation integrates local people in the decision-making process and therefore creates a higher degree of transparency and ownership, i.e. follows the principle of subsidiarity (KPS, 2009)

The Transnational Institute (TNI) is a vocal critic of privatisation internationally and reports decentralisation in “prominent cities such as Buenos Aires, Johannesburg, Paris, Accra, Berlin, Atlanta and Kuala Lumpur. Remunicipalisation is also accelerating: 81 remunicipalisations took place in high-income countries between 2010-2014, double the number of the five previous years” (TNI, 2014). A report by the TNI and its partners at the Multinational Observatory and the Public Services International Research Unit (PSIRU) showed that 180 cities across 35 countries have ‘re-municipalised’ with 100 of the reversals in the US and France, 14 in Africa and 12 in Latin America (Lobina *et al.*, 2014). The vision of this group has been expressed by McDonald (2012, p. 15): “remunicipalisation should not be seen as a linear, two-way street between polarised notions of private versus state delivery, but rather as a remaking and rethinking of what it means to be public, and a revisiting of how we define successful water services”.

The strong demarcation lines in the ongoing debate between privatisation and local government management along with negative public perceptions of privatisation make objective assessment of the two alternative models difficult. Nevertheless, two factors are beyond doubt: (1) privatisation of WSS has seldom been successful globally but (2) local government WSS regularly suffer from intrinsic limitations, not least of which is underinvestment in critical infrastructure and human resources. In Australia, these facts were reflected in the national reviews of the water industry (AECOM, 2010; NWC, 2011a; PC 2011a) which questioned the local government model but did not support privatisation

In Australia, there is currently “private sector participation in the supply of services to the industry, in the operations of some assets, and a few examples of private finance through private schemes, asset sales and PPPs” (Cade, 2015, p. 45 and see IA, 2013). The paucity of private funding is seen by many as major gap. The Australian Government competition policy review noted that “in general, urban water pricing fails to reflect its cost of provision and this is discouraging private sector participation in providing urban water” (Harper *et al.*, 2015). Commentators, particularly those from the private sector and academia regularly call for a reassessment of the benefits of privatisation and private investment (see recent

articles by Schott, 2015; Cade, 2015; Blyth, 2015; Matthews, 2015; Hillis and Fonti, 2015) and the *National Infrastructure Plan*, Infrastructure Australia notes “most of Australia’s water assets are publicly owned including \$50 billion to \$60 billion of water infrastructure suitable to be transferred to the private sector” (IA, 2013, p. 63).

Privatisation carries significant public risk, not least of which are increased prices to achieve cost-recovery, recover historic under-investment and also to achieve the dividend required by private investors. Some of these are necessary evils and some commentators insist privatisation is the only way to overcome the intrinsic inefficiencies of public management, make prices cost-reflective and to ensure increasing investment in ageing assets. However, a notable limitation of this approach is an intrinsic focus on ‘profitable’ schemes, which investors require to ensure a reasonable income stream. Even those calling for reassessment of private investment in Australia recognise that “the most attractive businesses for private investors are the large city-based utilities and some regional utilities with sufficient scale. Water and wastewater provision in other, more scattered and remote localities are not likely to be of interest to the private sector” (Schott, 2015). The concentration of Australia’s population in large coastal cities may make such centres appealing but also means that the majority of supply schemes and sewerage networks in regional Australia (which are isolated and support small numbers of rate payers) are unattractive. Unfortunately it is often these numerous small communities where increased investment and efficiency gains are most needed.

Currently in Australia, privatisation remains rare even in the capital cities and the prime example of (partial) private ownership, namely Actew-AGL in the ACT, has recently been transferred back to full public ownership and the water utility rebranded (“IconWater”) in 2015 to avoid “continual confusion” of customers with the private utility (ACTEW Water, 2015). In contrast, private ownership of individual treatment plants is becoming more commonplace (often as part of the ‘design-build-operate-own-transfer’ spectrum) and while network management and retail functions are almost exclusively publically owned, their operation is increasingly being outsourced. Indeed, outsourcing and ‘private-public-partnerships (PPPs) are often seen as a middle-ground approach to accessing the benefits of both private and public management (Hillis and Fonti, 2015) and are explored further in the next section.

3.2 Private sector participation: Outsourcing

‘Outsourcing’ is defined broadly in this report to encompass the diverse range of mechanisms used across the urban water sector (e.g. service contracts, management contracts, lease/affermage, concession, and various PPP arrangements including alliances, consortia, and joint ventures (Figure 1 and see PWC, 2011b, Cuadrado-Ballesteros *et al.*, 2013; Devkar *et al.*, 2013; Ouda *et al.*, 2014). Under outsourcing arrangements, “the local administration retains ownership and to a large degree maintains decision and control capacity, but private entities provide and manage the services in question” (Cuadrado-Ballesteros *et al.*, 2013, p. 25). The aim is to increase efficiency and productivity by using specialist suppliers allowing owners and managers to focus solely on strategic local needs.

	Setting Performance Standards	Asset Ownership	Capital Investment	Design & Build	Operation	User Fee Collection	Oversight of Performance and Fees
Fully Public Provision	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red
Passive Private Investment	Dark Red	Dark Red	Light Red	Dark Red	Dark Red	Dark Red	Dark Red
Design and Construct Contracts	Dark Red	Dark Red	Dark Red	White	Dark Red	Dark Red	Dark Red
Service Contracts	Dark Red	Dark Red	Dark Red	Dark Red	White	Dark Red	Dark Red
Joint Ventures	Dark Red	Light Red	Light Red	Light Red	Light Red	Light Red	Dark Red
Build, Operate, Transfer	Dark Red	Dark Red	White	White	White	Dark Red	Dark Red
Concession Contracts	Dark Red	Dark Red	White	White	White	White	Dark Red
Passive Public Investment	Dark Red	White	Light Red	White	White	White	Dark Red
Fully Private Provision	Dark Red	White	White	White	White	White	Dark Red

Key: Dark Red: public responsibility - Light red: shared public/private responsibility - White: private responsibility

Figure 1: Public versus private responsibility across different forms of outsourcing arrangements for water and sewerage services. Source: Reproduced from OECD (2003, p. 2).

In Europe where a full range of outsourcing has been used for many decades, “the direct management formula (direct labour) still remains the top preference today in terms of the number of water and sanitation services utilities organised on this principal” (Barraque, 2012, p. 239). However, the extent of outsourcing has increased over time and is continuing to grow in many countries (see Tables 1 and 2 and OECD, 2003; OECD, 2006 and Hukka and Katko, 2009).

Joint outsourcing of management by neighbouring councils to a common private partner is a form of regionalisation pioneered and still commonly practiced in France (Pezon, 2009) and is increasingly practiced in Spain and the Czech Republic (Gonzalez-Gomez *et al.*, 2014) and some Nordic countries (Pietila *et al.*, 2009; Hukka and Katko, 2009). The degree of outsourcing varies in two key dimensions: the period of the contract, lease or concession, and the degree of responsibility/risk transferred to the private provider. In France where concessions have been common for over a century, the average period that management is delegated is 11 years but can be much longer. In contrast, in Nordic countries, three-year contracts for operations are the norm with less emphasis on management. This ‘competition for the market’ “eliminates the possibility of the monopolistic practices that can be identified with long-term concessions or in the full divestiture model of WSS ownership and management” (Seppala and Katko, 2012, p. 98). A similar model has been in place for some time in Australia in WA and SA for servicing the metro areas of these states using 10-15 year contracts.

Other aspects of outsourcing are relatively new to the water industry. For example “the practice of ‘third-party access’ meaning that alternative producers (e.g. providing extraction

and treatment of water) are given access to the networks, usually at regulated terms” (Sorensen, 2010, p. 19) is relatively untested. Such options are being increasingly explored in Australia but require a strong regulatory framework before being adopted in Queensland.

3.3 Regional aggregation of local services

In contrast to the ambiguous results from studies comparing efficiency of private versus public ownership of WSS, numerous quantitative studies have demonstrated benefits of economies of scale through regional aggregation (see reviews by Walter *et al.*, 2007; Worthington, 2010 and more recent studies in Estonia (Peda *et al.*, 2013), Italy (Pazi *et al.*, 2013 and Australia (Ananda, 2014)). Regionalisation has been achieved through three primary mechanisms:

- creation of large utilities to undertake some or all services (as in Auckland, England, Ireland, Northern Ireland, Scotland, Tasmania, Victoria and Wales);
- joint contracting or lease/concession arrangements that allow large private utilities to provide services across a number of local governments (as in France, Nordic countries, Spain, Mexico, USA (parts) the metro areas of SA and WA); or
- through councils gradually combining their activities with varying degrees of formality and corporatisation (as in the Belgium, Denmark; and parts of the USA, New Zealand and regional NSW).

Each of these mechanisms provides access to economies of scale which can be significant even for utilities serving numerous dispersed communities:

on occasions, enlarging the scale of production can achieve lower unit costs. This can proceed over time through a continuum ranging from the internal provision of services through to full contracting out. Through this process, water utilities overcome indivisibilities in factor inputs, avoid the costs of a lack of capacity, and gain access to economies in the fixed costs of production including purchasing, marketing and administration (including human resources and information technology). Unfortunately, this can be difficult in the context of an urban water utility as it is not always possible to adjust scale smoothly. For example, increasing scale may require ‘lumpy’ investment in dams, pipelines and treatment plants such that utilities will not be operating their infrastructure optimally through under or over-investment (Worthington, 2011, p.52).

In Europe, “the first step in the reforms introduced to the municipal model is often to organise joint boards of neighbouring municipalities to facilitate a fair distribution of the investment burdens. This is quite frequent in Germany, The Netherlands, Belgium, Italy, Switzerland and, in particular France” (Barraque, 2009, p. 239). Similarly, “regionalisation is generally favoured for the fragmented water sector” in the US through alliancing and joint outsourcing) particularly in large cities (Beecher and Kalmbach, 2013).

Despite the widespread trend for regionalisation, the optimal scale for WSS is not well understood. In Northern Ireland and Scotland mandatory regional approaches were later scrapped in favour of a single WSS entity for each jurisdiction to achieve greater economies of scale. A similar progression from local governments to regional to whole-of-jurisdiction occurred in Tasmania over the past five years. The ideal size of a utility is influenced by local

population size and density as well as geography and climate in complex ways making generalisations difficult. Customer perceptions also play an important role as regionalisation necessarily acts conversely to the subsidiarity principle distancing local populations from the direct management of WSS. In Australia it is clear that increasing size provides benefits for some WSS (WSAA, 2010; Worthington and Higgs 2014), but there is no clear rule as to what constitutes an optimal size and there are numerous examples of small utilities performing better than their larger neighbours.

An analysis of large (i.e. more than 10,000 customers) Australian WSS (Worthington, 2011, p. 68) showed:

strong economies of scale at relatively low levels of output (up to 75 per cent of mean output or about 90,000 connected properties). One implication is that horizontal aggregation will provide efficiency gains, especially if the composite utilities are located in close proximity and if the increase in scale is without significant investment in network costs. In the sample, 11 utilities are currently too large (experiencing diseconomies of scale with connected properties in excess of 125 000 properties).

Diseconomies of scale have been also been noted in other studies in Australia (PC, 2011b) and other jurisdictions (e.g. Beecher and Kalmbach, 2010). For example, a comparison of Victorian and NSW wastewater service providers showed the Victorian utilities were more technically efficient but were worse off in terms of scale efficiency and concluded that “‘bigger is not better’ in local public service delivery” (Byrnes *et al.*, 2009 p. 168). Curiously, even within NSW councils, one study raised the possibility “that some treatment works are too large, and the construction of additional, smaller plants may be advantageous when major upgrades take place” (Woodbury and Dollery, 2004, p. 627).

A recent study by Ananda (2014, p. 6) found “utilities serving more than 100,000 customers, have performed well relative to other types, supporting the extant evidence that scale economies are maximized at around 90–100,000 connected properties”. Surprisingly though, the analysis showed that utilities with between 10,000 and 20,000 connections ranked second, performing almost as well as the largest providers while those with 50-100,000 connections had the lowest efficiency scores (see Figure 3). Thus many ‘small’ utilities achieved almost best-practice efficiency rankings in spite of their size.

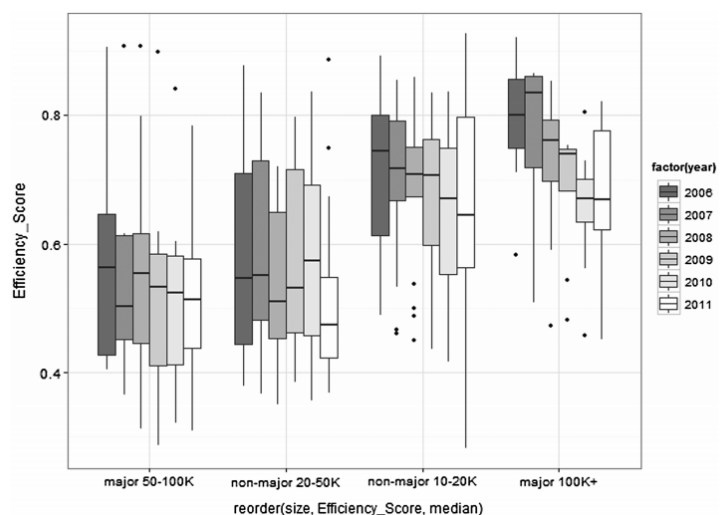


Figure 2. Efficiency comparisons of Australian utilities during 2005/06 to 2010/11 by size category. Reproduced from Ananda (2014, p. 6).

Considered together, the recent studies suggest that while scale is important in determining efficiency, other factors must also be critical. The general tendency for larger organisations to perform better than smaller ones likely has multiple

and correlated drivers and unfortunately, no studies to date have compared the performance of very small service providers (i.e. < 10,000 connections). Regardless, each of the national reviews of the Australian urban water sector in 2011 concluded that the potential benefits from economies of scale were worth pursuing and recommended regional approaches.

3.4 Commercialisation and corporatisation

Commercialisation is defined here as governance and management frameworks selected to place WSS on a more commercial footing consistent with successful modern water utilities (see e.g. QT, 2010). Corporatisation is a more extensive process meaning that business activities are carried out by a separate legal entity. The purported benefits of such approaches include clarification of objectives by distancing management from political decision making, selecting optimal governance structures, and attracting specialised leadership, management and human resources. These benefits have been sought through various degrees of commercialisation in numerous jurisdictions (see Section 2).

Commercialisation and particularly corporatisation have been argued to improve transparency and accountability for performance and to encourage WSS-specific management approaches thus providing some of the benefits espoused for private organisations while retaining public ownership. They can also institutionalise transparent ‘arms-length’ relationships with politicians thus reducing:

opportunities public ownership gives politicians and bureaucrats to further their own interests at the expense of efficient operations. For example, politicians may use their influence in public utilities to promote employment or support local suppliers. Furthermore, political needs and preferences may be relatively short-term, making it difficult to pursue a consistent business strategy (Sorensen, 2010, p. 22).

This view assumes that the agendas pursued by local politicians are detrimental to their communities, which is unlikely except where the WSS business is chronically underinvesting or consistently over-charging for their services or councillors are ignorant of the needs of their water business. However, the ability “to appoint directors and board members with business experience” relevant to WSS utilities (Sorensen, 2010, p. 23) could provide significant benefits, particularly where councillors have little experience in the oversight of WSS.

Increasing commercialisation has been seen as a method for local government managers to focus on WSS and remain abreast of new approaches and emerging issues:

water and sanitation utilities of most countries have traditionally been fairly conservative in their management and leadership approaches, and have largely focussed their efforts on managing technical systems. Yet, they are increasingly adopting more innovative, integrated and systematic approaches and styles of management and leadership. It is our argument that this is partly the result of the example and inspiration provided by private sector organisations, which public WSS utilities have started to imitate and follow along with the introduction of commercial principles in the water-services sector” (Seppala and Katko, 2009, p. 96).

The need for local and democratic oversight paired with critical mass to attract expertise-based governance and management may explain why corporatisation of local government-owned WSS, is so common within the WSS sector (see Barraque, 2012; Gonzalez-Gomez *et al.*, 2014). For example, in Denmark corporatisation became mandatory in 2009 (coupled with regional aggregation) and has achieved advantages including arms-length governance, though there is evidence that “management is also influenced by the decision-making logic of the political system” (Sorensen, 2010, p. 37). In Italy, corporatisation (with mixed public and private ownership) was mandated in 1994, but community dissatisfaction led to a referendum in 2011 with the result that corporatised entities must be publically owned and ‘not-for-profit’ (Massuratto *et al.*, 2013).

Across Australia, corporatisation and commercialisation on a ‘not-for-profit’ basis were recommendations of the ‘competition reforms’ of the 1990s and many utilities across the country were restructured as a result. Corporatisation is generally achieved through creation of statutory authorities and has become the model for WSS in all jurisdictions except regional Queensland and country NSW. All Victorian WSS were corporatised in the 1990s when WSS were transferred to state ownership. State/Territory-owned corporations predominate nationally and include: Sydney Water, Water NSW and Hunter Water, SA Water, Water Corporation and Busselton Water in WA, NT Power and Water and IconWater in the ACT as well and the bulk providers Seqwater, Gladstone Area Water Board and SunWater in Qld. Local government-owned corporations (other than Wide Bay Water) are scarce in Australia but have increased in number recently to include Unitywater and QUU (Qld – 2010), Central Coast Water (NSW in 2011), TasWater (Tasmania – 2013 based on four local government corporations formed in 2008).

3.5 Regulatory frameworks

Economic regulation of WSS is common to many jurisdictions (Table 1), critically impacts efficiency of WSS and has been said to require significant reform in Australia (see e.g. Byrne *et al.*, 2009 and 2010; Worthington, 2010; PWC, 2011a; NWC, 2011c; Frontier Economics 2014; Albon and Decker, 2015). “The purpose of such regulation is, first, to ensure a sufficient level of production, second, to prevent monopolists from exploiting consumers by overpricing their products and third, to ensure a cost efficient production” (Lonborg, 2005, p. 3). Good economic regulation goes beyond policing pricing and typically has five main purposes, namely (1) ensuring consistent services in spite of variability in size and structure of service providers, (2) balancing independence and industry knowledge, (3) balancing competing regulatory and customer externalities (4) providing an appropriate environment for effective private sector participation and (5) effective and efficient performance monitoring for benchmarking.

Beecher and Kalmbach (2013, p. 44) reviewed the benefits of effective economic regulation noting that many applied regardless of, or perhaps because of, the vast variation in WSS providers in the US water sector.

Given variability in water costs, comparability in water prices is not expected. Given variability in ratemaking practices, prices may not be cost-reflective. Although by no means the only institutional alternative, extension of economic regulation to the public

sector is a proven governance option. Regulation can advance the adoption of principles and practices that have stood the tests both of time and judicial review. Regulation serves the public interest by balancing the interests of utilities (fair returns) and ratepayers (just prices). Regulation can also provide transparency and accountability as well as general uniformity in ratemaking. Compared to most local governments, state agencies possess greater technical and institutional capacities for regulatory oversight. Independent regulators can also help depoliticize the ratemaking process and give coverage to local officials who may lack political will for difficult decisions. Ensuring that prices reflect the prudent cost of service, the central purpose of economic regulation, is a legitimate social goal for all water utilities.

Although the diversity of large jurisdictions like Queensland make regulation difficult, this means that frameworks are even more necessary to balance variation and ensure appropriate outcomes. However, ensuring this is undertaken in a fit-for-purpose and affordable fashion can be difficult and compliance costs of different forms of regulation must be weighed carefully.

The importance of an independent Regulator with sufficient industry knowledge has been acknowledged in Australia (e.g. NWC, 2011; Frontier Economics, 2014; Blyth, 2015) but must be carefully implemented to avoid excessive costs (Matthews, 2015). “Independent regulatory authorities are argued to be better guarantees of unbiased and stable regulation than e.g. ministerial offices, since they are more insulated from the pressures of organised interests and fluctuating public opinions” (Sørensen, 2010, p.21). An independent regulator can also help with the balance between the need for a well-informed water specific regulator (to overcome the information asymmetry in dealing with highly technical utilities) and the risk of ‘capture’ by the industry. “Regulatory authorities that are part of general competition authorities may be less vulnerable to capture, i.e. over-identification with the sector and policy area in question. On the other hand, sector-specific regulatory authorities may be better equipped to match the technical knowledge and information resources of the regulated companies” (Sørensen, 2010, p. 21). Clearly a balance must be struck considering the costs as well as the benefits of each model.

Consideration of the need for regulation to take into account competing (and sometimes conflicting) externalities has also been considered. Environmental protection, water conservation and customer willingness-to-pay can drive utilities towards opposing strategies:

In recent years, a debate has unfolded in Britain regarding the role of economic regulators in integrating sustainability concerns in regulation. It can be argued that policy integration and trade-offs between economic, environmental and social goals should be made by government departments. However, Bartle & Vass argue that this is ineffective, given the indivisibility of policy and implementation issues in technical sectors and the information asymmetries between regulators and government departments. They maintain that policy integration should take place at the level of regulators, who should ensure that their regulatory actions are designed to achieve sustainable outcomes” (Sorensen, 2010, p. 29).

Under this approach, regulators should:

- 1) be obliged to work for broader objectives than economic efficiency,
- 2) support integrated policy development, and

- 3) engage more in dialogue with central government, other governmental and non-governmental organisations and the public (Sørensen, 2010).

The fact that regulation controlling environmental management, customer service, water pricing and water conservation are managed under a raft of different legislation in Queensland and most other jurisdictions internationally (see Table 1) means a mechanism for integration is critical. Failure to integrate and manage the trade-offs among often mutually exclusive drivers creates confusion and conflicting objectives for WSS regardless of institutional model (PC, 2011). It is this confusion which has led some to recommend national regulation in Australia which has:

a complex regulatory system. Each state and territory has its own economic regulator, some more mature than others, with the seven regulators serving a population of 22 million people. By comparison one water regulator in the United Kingdom serves more than 60 million people. As a result of changing priorities, short term political and public pressures can strongly influence the direction of the water industry, and pull states in different directions (IA, 2013, p. 60).

Further work is needed given that it is likely economic regulation of public utilities will continue to evolve over the next decade (Albon and Decker, 2015).

Underpinning many regulatory frameworks internationally are performance monitoring and benchmarking processes to encourage ‘competition by comparison’ (see Figure 3). “Performance measurement has several main objectives to support decision making; to change behaviour and increase motivation; to monitor performance trends; to state priority and actions; to verify the effectiveness of optimization measures already implemented; to aid dissemination of organizational results via marketing; and to aid benchmarking” (Vilanova *et al.*, 2015). Because of the natural monopolistic nature of WSS, “it is necessary to simulate market forces through the use of comparative competition techniques such as benchmarking. League tables are effective as no manager wishes to be bottom of any league” (Rouse, 2009, p. 149). This technique has been effective in Chile, Denmark, England and Wales, The Netherlands Canada, Japan and The USA (see Lonborg, 2005; Rouse, 2009; PWC 2011b; Haider *et al.*, 2014; Marques *et al.*, 2014) and has been in place for some years in NSW (NOW, 2011), Tasmania (OTTER, 2011; but see DTF, 2014 which has suggested ceasing regular benchmarking reports) and for large utilities in Australia (NWC and WSA, 2014).

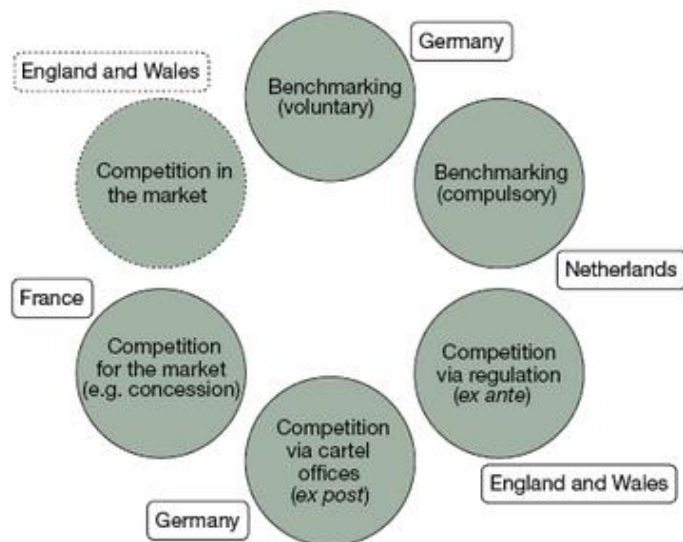


Figure 3: Regulatory approaches for water and sewerage services in Europe. Source: Oelmann and Czichy (2013).

Benchmarking has elements of both competition and collaboration, but different approaches emphasise either competition or collaborative learning as the main mechanism for improvement [...and...] price regulation based on efficiency benchmarking is a strong example of the competitive approach. It is also described as 'managed competition' or 'yardstick competition'" (Sørensen, 2010, p. 25).

It is recognised however that “benchmarking as quasi competition also entails some challenges, including how to handle heterogeneity and how to take account of other performance aspects than efficiency” (Sørensen, 2010, p. 25) and this is particularly difficult for small WSS (Haider *et al.*, 2014 a,b).

All Australian jurisdictions other than Queensland have several years of data from internal performance reporting systems or report through the National Performance Reporting (NPR) framework. Indeed, the strong regulatory framework in Victoria has been claimed as an important factor promoting efficient WSS in that state versus local governments in NSW (Byrnes *et al.*, 2009, 2010). Interestingly, the majority of other jurisdictions including all States in Australia except regional Qld and Country NSW also have a price-setting framework (Table 1) but there have been numerous reports recommending stronger regulation of urban water (e.g. PC, 2011; NWC, 2011c; Frontier Economics, 2014; Harper *et al.*, 2015).

3.6 Identification of success factors

The frequent recurrence of regionalisation, commercialisation/corporatisation, strategic outsourcing and also the strengthening of regulatory frameworks across many jurisdictions, particularly those with enduring WSS models identifies these trends as potential ‘success factors’ for the sector. In contrast, privatisation, though successful in isolated cases, must be considered with caution because of the significant failures and reversals that have occurred with this approach in most instances.

Although local government ownership dominates the industry and is often favoured after privatisation or centralisation have failed, there has been significant reform even in many jurisdictions where local government management has not been challenged. This is consistent with the principle of subsidiarity which involves centralisation of tasks that cannot be performed at a more local level. However, determining the optimal scale is complicated where small local governments are competent but lack the capacity or scale to provide services efficiently. The next section considers the alternative models available to regional Queensland and the large area and numerous small communities served.

4 Implications for Queensland

4.1 Relevance of models to regional Queensland

The sustainability of the local government model prevalent in regional Queensland (and country NSW) has been brought into focus by recent national reviews. Management (and

sometimes ownership) of WSS by individual local governments was questioned in NSW (see Armstrong & Gellatly, 2008) and criticised more broadly in both Queensland and NSW by Infrastructure Australia (AECOM, 2010), the National Water Commission (NWC, 2011a) and the Productivity Commission (PC, 2011a). Each of the reviews suggested alternative institutional arrangements would be more appropriate than local government ownership and management though the reports did not agree on a single ideal model.

The most recent and comprehensive review was undertaken by the Productivity Commission and recommended investigation of “the relative merits of alternative organisational structures, including county councils, regional water corporations and regional alliances (or regional organisations of councils)” (PC, 2011a). The review highlighted the need to ensure any alternative model fits the needs of a specific region based on local drivers but highlighted the importance of economies of scale and commercialisation and noted the need for greater outsourcing and clearer regulatory frameworks.

This broad-based recommendation by the Productivity Commission reflected (in part) the findings of a number of earlier reviews by the National Water Commission (NWC) which had repeatedly called for institutional reform in Queensland and NSW but avoided suggesting alternative models. For example, NWC (2009) proposed that “structural /organisational reforms (for example, aggregation and shared service models) and regulatory reforms may warrant further consideration in some rural and regional areas, particularly where services are currently provided by local government authorities”. The 2011 review by the NWC concluded “structural and institutional reform of local council service provision in New South Wales and Queensland is urgently needed. However, the Commission acknowledges that a range of models and transitional approaches may be appropriate, and does not recommend a particular model” (NWC, 2011a, p. 4). These recommendations were reiterated in the NWC’s ‘Third Biennial Assessment’ (NWC, 2011b, p. 136) and the Triennial Assessment (NWC, 2014).

In contrast, the national review of WSS by Infrastructure Australia focussed on regional water quality and security in towns with populations from 2,000 to 15,000 people but it nevertheless made prescriptive recommendations for all Queensland service providers (AECOM, 2010). Three alternative models were proposed in order of preference namely:

1. state-owned regional water corporations (based on catchments),
2. mandatory catchment-based regional alliances with local government ownership, or
3. a single State-owned entity outside SEQ with regional management.

The third option was discounted because “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” (AECOM, 2010, p. vi). This option was also rejected by the later review by the Productivity Commission which noted that very large service providers in some Australian States and Territories may be subject to diseconomies of scale (see Section 3.2). Later reports by Infrastructure Australia have reiterated the call for centralisation and even privatisation of WSS and local governments in Queensland (IA, 2013).

The models recommended in the 2011 reviews are summarised in Table 3 using a classification scheme modified from Seppala and Katko (2009) which arranged WSS from

purely public to fully private ownership and management. This scheme has been modified to:

- (1) include different governance and management structures for each ownership model,
- (2) distinguish ownership at local, regional, and national scales and
- (3) provide information on the range of outsourcing options practised under each model recognising that even publically-managed WSS outsource some services.

In reality, WSS seldom fall at either end of the spectrum but Britain and the Netherlands “which are often referred to as forerunners in water sector reform” (Sorensen, 2010, p. 7) provide polarised examples. England and Wales are among the few jurisdictions where there has been long-term success from full privatisation while the Netherlands firmly rejected privatisation in the 1990s and developed regionalised local government-owned (and commercialised) WSS. Some developing areas have purely public ownership and management of WSS (Seppala and Katko, 2009) but the majority of the jurisdictions reviewed outsource some activities while a minority delegate all management responsibilities to the private sector.

In Australia, many of the models (excepting full privatisation and full public management) are represented accompanied with varying degrees of outsourcing. In most jurisdictions including the large metro areas of NSW, State or Territory governments own and manage corporatised WSS at regional (Victoria, metro NSW) or state/territory scales (ACT, NT, SA and WA). Tasmania is one exception: WSS have recently been merged into a single state-wide corporation jointly owned by local governments. Notably, regional Queensland and country New South Wales are the only jurisdictions where numerous WSS schemes remain owned and managed by local governments.

Outsourcing of some activities is common in all jurisdictions, and can represent up to 73% of OPEX and 90-100% of CAPEX in large state-owned utilities in Australia (see Figure 4). While private sector participation is common to all but model 1, the degree of outsourcing of management varies greatly and ranges from contracting of non-core activities (e.g. design and construction) to full delegation of all management services (e.g. in France, Spain and the metro areas of Adelaide and Perth in Australia). There is also a degree of minority private ownership in a number of jurisdictions (noted with an asterisk ‘*’) within the category that describes their majority public owner. Some major cities in the USA, Europe and South America have trialled partial private ownership but this is a constantly changing arena (see e.g. Lobina, 2014). In Australia, ActewAGL had minority private ownership for a number of years but was transformed to full public ownership in 2015.

In Table 3, the degree of regionalisation tends to increase with increasing model number through the table. Individual councils are succeeded by council alliances and joint council corporations, reflecting the evolution of horizontal aggregation in several jurisdictions. The degree of commercialisation also tends to increase in this direction with model 3 and models 9-12 extending commercialisation to corporatised structures. Consequently, the degree of independence from local government political issues also increases through the model numbers, though models 10 and 11, which have central government ownership, will be subject to varying degrees of State or national political influence.

The final columns of Table 3 provide an indication of whether each model was deemed to be appropriate for WSS in regional Queensland according to national reviews of the sector. All recommendations highlighted the benefits of economies of scale and thus some degree of regionalisation was common to the recommendations. Similarly, the reviews encouraged commercialisation (or more commonly corporatisation) as a mechanism to put WSS on a more commercial footing and drive towards cost-recovery pricing. Each also recommended rationalising the regulation of WSS in Queensland (and elsewhere in Australia). While none of the reviews suggested privatisation, each was critical of management by individual local governments (and consequently recommended the range of modifications described above). As might be expected, the recommendations of the national reviews for regional Queensland closely reflect the trends (or success factors) identified for the WSS sector globally.

The next section explores the implications for regional Queensland of each of the key trends common to successful and enduring reform of WSS.

Table 3: Selected properties of institutional models for water and sewerage service providers in OECD and G20 countries.

	Model	Governance	Owner(s)	Management (primary)	Operations/Staff (primary)	Outsourcing	Jurisdictions in which this model occurs. (Qld in bold)	Recommended for Qld?		
								IA	PC	
1	Full public ownership and management	LG	Individual LG	LG	LG staff	None	India, Indonesia	✗	✗	
2	LG service provider	LG Councillors.	Individual LG	LG	LG staff	Most capital design and construction. Outsourcing of operations and/or management via contract, lease or concession ranges from limited to extensive (e.g. Czech Republic, France)	Qld and NSW regional councils. Argentina, Canada, Czech Republic, Finland, France, Germany, Iceland, India, Indonesia, Italy, Japan, Mexico, New Zealand, Norway, Portugal, Spain, Slovenia, Sweden, & USA. Sewerage services in many countries	✗	✓ (only for councils that can be shown to be financially efficient)	
3	Commercialised LG service provider.	LG Councillors or Advisory Board		LG	LG staff					Some large Qld and NSW councils have a degree of commercialisation and separation from council. The Netherlands
4	LG-owned corporation	Board responsible to council		Corporation	Staff employed by corporation					Wide Bay Water, Denmark, Estonia, Japan, Johannesburg, Netherlands, Poland
5	Regional Alliance of councils (voluntary)	LG Councillors or Advisory Board	Jointly by 2 or more LG	Management team from LGs	Employed by owner councils		Lower Macquarie Water Utilities Alliance, Centroc Water Alliance, CTM Alliance (N Qld), RAPAD Water Alliance (W Qld), Belgium	As an interim step	✓	
6	Mandatory (binding) Regional Alliance				Employed across councils with pooled resources					France, Iceland, USA
7	'County Council' (service provision only)	Board of LG Councillors	Two or more LG via a regional entity	County council	Employed by county council		Contracting out non-core services	Five county councils in NSW (only one also provides sewerage services)	not mentioned	✓
8	'County Council' (incl. asset ownership)	Board of LG Councillors				Midcoast Water (NSW). Regional Council model in NZ can be similar (e.g. Greater Wellington RC)				
9	Regional Utility (Joint LG ownership)	Board appointed by LGs				National or State/ Provincial government		Regional Utility	Staff employed by utility	Contract non-core services. Some leases or concessions for some/all management and Operations
10	Regional Utility (Central government ownership).	Independent Board – usu. reports to Minister(s)	China*, SEQ Water, Gladstone Area Water Board , India, Italy, Melbourne Water, Victorian Utilities, Sydney Water, Hunter Water, Brazil	✓	✓					
11	Whole-jurisdiction public utility (Central Government)		ACT, WA, SA Water, NT, Northern Ireland, Scottish Water, Irish Water	✓	✗					
13	Primary or full private ownership	Private entity Board	Private Company	Private Company	Private Company staf	Outsourcing non-core work or partnership with other businesses.	England & Wales, Chile, Saudi Arabia (major cities).	✗	✗	

* There are some utilities with minority private ownership within jurisdictions marked (*). LG= Local Government; IA= Infrastructure Australia (see AECOM, 2010); PC = Productivity Commission (see PC, 2011a).

Source: Adapted from Seppala and Katko (2009) and Fearon (2012).

4.2 Impact of global trends in regional Queensland

The global trends of regionalisation, commercialisation/corporatisation, increased outsourcing and improved regulatory frameworks correlate with improved WSS internationally and are consistent with the recommendations of national reviews of the Queensland WSS sector. Although privatisation was not recommended and does not appear to be a 'success factor' for the industry, it is considered first briefly for completeness.

4.2.1 Privatisation

The often heated debate about private versus local government ownership (see Section 3.1) makes objective assessment of potential benefits and risks of privatisation in Queensland difficult to substantiate. Fortunately, four objective factors rule this option out of further consideration without need to resolve the argument. First, the documented poor success rate for privatisation internationally (see e.g. Lobina *et al.*, 2014) and the failure to identify efficiency benefits of private over public WSS models (e.g. Worthington, 2014) provides significant cause for pause particularly for a model that has not been tested in Australia.

Second, even if this barrier were overcome, privatisation (of assets in general) has received significant political and public attention in Queensland in early 2015 and is not currently favoured. Third, if the political and technical issues could be resolved, even supporters of privatisation in Australia acknowledge that small regional services are not attractive to the private sector (e.g. IA, 2013; Schott, 2015). This means that the majority of regional Queensland (including the communities that most lack capacity) would not be considered for private investment eliminating one of the key benefits for change.

Finally, and perhaps most importantly the fact that none of the national reviews supported privatisation in regional Queensland is telling given the significant investigation undertaken for each (see Section 4.1). Even Infrastructure Australia which is supportive of divesting WSS assets (see e.g. IA, 2013) did not promote privatisation as a viable option for regional Queensland (AECOM, 2010).

4.2.2 Outsourcing

The trend for increased levels of outsourcing is reflected in Australia where many forms of private sector involvement have increased over the past two decades. Nationally and across Queensland, capital works are typically outsourced and large Australian utilities outsource between one and two thirds of operations expenditure (Figure 4, and see PC, 2011a; Byrnes, 2013). There are some exceptions; for example ABC (2015) reported public and Union concern over the impending privatisation of the 'engineering and construction services' branch of WA's Water Corporation, a role that is often already outsourced in many utilities.

The degree of outsourcing across Queensland has not been documented but anecdotal evidence indicates that it is widespread though not as common as in other Australian jurisdictions. CAPEX is commonly outsourced by the majority of service providers. There are examples of contracts for management among smaller councils, many of which

Water utility	Operating expenditure (%)	Capital expenditure (%)
Water Corporation (WA)	30	93
Sydney Water	72	94
Sydney Catchment Authority	64	99
Melbourne Water	73	100
South East Water (Victoria)	42	90
Yarra Valley Water (Victoria)	58	98
Hunter Water (NSW)	65	100
SA Water	65	94

Figure 4: Proportion of expenditure outsourced in 2009/10 by large Australian water utilities. Source: Reproduced from PC (2011a, p. 114).

outsources management to regional consultants, while larger organisations routinely contract specific activities to the private sector. There are also scattered examples of private management of entire plants as part of the design-build-own-operate-transfer spectrum while alliance arrangements have been adopted by some of the larger service providers. The increase in private sector participation in other jurisdictions is reflected by the experience reported by WSS providers in Queensland.

Given the likelihood of further increase, a regulatory framework supporting outsourcing while protecting the interests of local communities and private interests alike is an emerging need. It is well accepted that privatisation must be undertaken only within a regulatory framework to protect consumers, safety and environmental health and “successful corporatisation presupposes that relevant public interests can be safeguarded through arm’s-length mechanisms such as laws, licenses or contracts” (Sørensen, 2010, p. 8). However, Rouse (2009, p. 150) has also pointed out that “independent regulation can provide the basis for successful contracting-out”. In particular, a regulatory framework can provide:

- clarity on the conditions on which contracts are based,
- due consideration where there is poor information on system condition,
- a system for integrated planning,
- the framework for periodic reviews of contracts, and
- mandatory consumer consultation and transparency.

However, Rouse (2009, p. 150) also noted that such regulation “is often resisted by both cities and contractors as interfering in commercial transactions; but this should not be the case. It is not for a regulator to be involved in the contract details, but to ensure that the information on which contracts are based is sound”. This last factor is particularly important for Queensland where skills and experience in managing external contracts can be underdeveloped. Devkar *et al.* (2013) recommended “the government has to lay down a clear policy framework for bringing clarity on issues such as provision of WSS services by the private vendors” particularly to support areas where cost recovery is difficult or impossible. This is particularly relevant to Queensland’s small and remote communities where local employment is also an important factor. “Evidence also shows that regulators and competition agencies have a stronger role to play than they are credited for by policymakers betting on PPPs. And so do regulation, liability rules, and authorized contractual provisions, even if their optimal design is likely to differ” from place to place (Estache & Saussier, 2014).

4.2.3 Commercialisation and corporatisation

Commercialisation of Queensland services (primarily via corporatisation at a regional scale), was a recommendation common to reviews by Infrastructure Australia (AECOM, 2010) and the Productivity Commission (PC, 2011a). A degree of commercialisation already exists in the Queensland urban water sector. As part of the ‘competition reforms’ of the 1990s, large local government service providers were required to adopt commercial practices and arms-length political oversight and this was institutionalised in some councils, with joint water utilities created in some regions. Current legislation still requires that large³ WSS form a commercial business unit and operate under the “key principles of commercialisation” (section 28 of the Local Government Regulation 2012). There are also provisions requiring full cost recovery and transparent competitive neutrality including identification of the value of community service obligations and tax equivalents. Small WSS providers are not subject to these requirements and many do not fully recover costs of WSS.

Despite the continuing legislation, commercialisation requirements were effectively diluted with local government amalgamations in 2008. At that time, the Queensland Local Government Reform Commission (supporting the findings of the earlier Electoral and Administrative Review Commission), raised concerns about “any system that removed accountability away from local government to an unelected board or committee” (LGRC, 2007, p. 45). All existing joint local government WSS entities were dissolved and council amalgamations invariably drew arms-length commercial water services back within the management structure of councils. In the succeeding years Australia’s first local government-owned corporation (Wide Bay Water Corporation) was partially re-integrated with its owner (Fraser Coast Regional Council), with a decision on the final future of the Corporation likely in 2016. Commercialisation in regional Queensland is thus currently limited to a small number of service providers.

In stark contrast, during the same period, there was a wave of corporatisation and regionalisation of WSS in south east Queensland. Eight corporatised statutory authorities with either joint local government or state ownership were created rapidly as the existing WSS structures were aggregated and re-aggregated (see Table 2). Five of these corporations were dissolved within four years of establishment and their services transferred to other authorities or returned to local government. The corporate model can thus be said to have been partially successful to date in Queensland. However, the current bodies have been in place for too short a period for a meaningful assessment, although initial indications are that they are now performing strongly. Other statutory water authorities in Queensland include the state government-owned SunWater and Gladstone Area Water Board and have demonstrated enduring success but, being solely bulk water providers, do not provide an appropriate benchmark for the majority of the urban WSS sector.

³ The scale at which WSS must form a commercial business unit is defined under S 19(2) of the Local Government Regulations 2012 based on annual expenditure of \$13.6m.

The concerns of the Local Government Reform Commission that Corporatisation may remove accountability from elected officials are shared by other commentators who suspect “the formation of public enterprises can be considered an intermediate phase on the way towards the probable ultimate outcome of New Public Management: the privatisation of most publically owned utilities” (Vinnari & Näsi, 2008). However, in other jurisdictions, both of these fears have been addressed through careful regulation and oversight of the governance of corporatised WSS by their local government owners and few have proceeded to privatisation (Section 3.4). In many of these cases the ‘arms-length’ distancing of WSS management from political influence has actually been seen as an advantage. This may explain the increasing prevalence in many jurisdictions of WSS combining local government ownership/oversight with a corporatised delivery entity.

4.2.4 Regionalisation

Aggregation and regionalisation of Queensland local government WSS was a common recommendation by all three national reviews (AECOM, 2010; NWC, 2011a; PC, 2011a). A variable aspect of the recommendations was the degree to which the collaborative arrangements should be formalised. Informal council alliances were generally regarded as a transitional arrangement on the path to fully corporatised regional organisations.

In contrast, Queensland’s 2007 Local Government Reform Commission, was supportive of council alliances as “a mechanism that delivers cost efficiencies to councils in the provision of infrastructure and utility services, thus assisting their financial sustainability” (LGRC, 2007, p. 48). The Commission went on to outline the basic parameters of a council alliance, noting that complexity may vary but “a simple alliance model is essentially a contracting methodology that enables:

- a more formalised and coordinated approach to the planning and programming of significant infrastructure for roads, water and a range of other services;
- a more efficient use of resources in the delivery of that infrastructure; and
- longer term commitments to be entered into for contracting work. This improves the prospects of sustaining jobs and retention of skills (which is a particular issue for rural and remote communities)” (LGRC, 2007, p. 49).

The Commission’s review resulted in significant amalgamations of councils and consequently aggregation of water services. Recommendations for regionalisation of WSS seek to extend the horizontal aggregation of WSS function of local government further while some agencies have continued to call for further restructure of councils themselves: “in New South Wales and Queensland, there is an urgent need for regional governments to amalgamate” (IA, 2013, p. 79).

Despite their differences, the national reviews all highlighted the potential benefits of economies of scale but acknowledged (to different degrees) the competing factors of economies of density and of scope which limit regionalisation in a large and dispersed State like Queensland. A tacit rationale for regionalisation of WSS is to incorporate small communities within larger organisations to cross-subsidise the cost-to-serve and to spread risk (see e.g. Rouse, 2009; PWC, 2011b; Massuratto *et al.*, 2013). Unfortunately, the costs to sustain small isolated WSS remain high regardless of the model adopted and often exceed

the value of even the most optimistic efficiency improvements projected from economies of scale. This means that unplanned regionalisation merely transfers fixed costs to neighbouring communities which may themselves be marginally sustainable. This can result in inequities at a broader scale (PC 2011a) particularly because of Queensland's relatively large and unevenly distributed regional population (Fearon, 2012).

This last point may explain why Infrastructure Australia warily considered a state-wide utility for regional Queensland owned by the state government (AECOM, 2010). This model would certainly spread the costs of servicing small and isolated towns but the recommendation excluded the largest population centre in South East Queensland so would maintain inequities within the State⁴. A more balanced approach to regionalisation was proposed by the Productivity Commission entailing a transparent review of how such costs could be shared to ensure the sustainability of all communities, recognising the needs of diverse customers. This reflects the understanding of the industry more broadly:

in any given country, the optimal size of water and sanitation services organisation depends not only upon physical-natural dimensions such as rainfall, catchment sizes and population densities, but also upon the degree of trust that society can place in its institutions at various levels. In Europe today, the optimal level of organisation is clearly moving towards supra-local, as well as infra-regional multilevel arrangements (Barraque, 2009, p. 247).

In a similar vein, it was broadly accepted in all of the 2011 reviews that regionalisation in Queensland is difficult because of the range of issues that need to be addressed and that these could be exacerbated by hasty or imprudent restructuring.

Determining the optimal scale for regionalisation is also difficult. Work by Worthington (2011) and Ananda (2014) showed that, on average, greatest efficiencies were achieved by utilities with around 100,000 customers although often smaller utilities were equally as efficient (see Section 3.3). A similar optimal size has been reported for Latin American countries (Foster, 2005). Achieving service providers of this size would require inclusion of vast areas even in many of the most populated parts of Queensland because of the size of the state and distribution of the population. In contrast, the entire state of Victoria (where regionalisation has been highly successful) is only just over half the size of Queensland's first regional alliance based on five of the central-west 'RAPAD' group of councils. The national review by Infrastructure Australia called for management at a catchment scale (AECOM, 2010), this is also difficult in Queensland where western catchments are vast and many communities source water from the even more extensive Great Artesian Basin. Along the coastal strip where populations are larger and catchments often small, the spread of communities means that economies of scale can be achieved only at the expense of economies of density. Creating regions with optimal population size in Queensland is demographically and geographically challenging and may fail to yield economies of scale common to more densely settled jurisdictions.

⁴ In comparison, in Western Australia a single state utility services 1.5 times the area (but less than a third of the population) of Queensland. Regional services are subsidised by the state capital and are often provided jointly with local governments. In Victoria, regional utilities are self-sufficient, but service significantly smaller areas and towns with greater population densities.

Nevertheless there are examples of successful alliances in regional Queensland. The first water alliance was formed in 2009 among Cairns, Townsville and Mackay councils (the CTM Alliance) “to improve efficiencies, generate cost savings and deliver an improved level of service to customers” (MRC, 2013). The CTM Alliance is based on shared issues of the three large councils, rather than on a regional area (the council areas are not contiguous). To date, work has focused on a pricing and financial sustainability model, negotiations with the state and other stakeholders “about reform within the industry” and “bulk purchasing and trialling new technologies in order to improve efficiencies and secure savings through joint procurement” (MRC, 2013). The Outback Regional Water Alliance in western Queensland commenced in late 2014 as a result of the initial QWRAP investigations and two other QWRAP regions (Whitsunday and Wide Bay Burnett) are currently scoping regional Alliances.

4.2.5 Regulation

All three national reviews criticised the regulatory frameworks in Queensland and called for reform to align and clarify regulatory requirements for WSS (AECOM, 2010; NWC, 2011a; PC, 2011a and see WSAA, 2010 and Frontier Economics, 2014). Economic regulation is common in other jurisdictions (Table 1) and integrated regulation has been promoted by numerous authors:

For reform to be successful, there must be an underlying coherence between the form of regulation and the institutional nature of the regulated entities. This need for coherence manifests itself at two distinct levels. First, the political and geographical jurisdiction of the regulator must be compatible with that of the service providers. Second, the choice of regulatory instruments must be suitably adapted to the managerial incentives of the water operators (Foster, 2005, p. 2).

There is no economic framework outside of South East Queensland, where the State wide Queensland Competition Authority is currently developing controls for the relatively new WSS entities. In a positive move, the Queensland Government recently developed a performance reporting framework in consultation with the industry with data collection commencing in mid-2014 to be ultimately reported in 2015. This approach has been strongly supported by the industry and moves Queensland towards best practice on a national and international level (where benchmarking is widespread).

Performance monitoring could be developed to underpin a regulatory economic framework for the state. However, the Queensland government is yet to set targets for the performance measures they are collecting and “while any action to improve performance is rarely implemented without scrutiny, governmental action is imperative in setting performance targets for the water supply sector, effectively serving the public interest and meeting the associated sustainability requirements” (Vilanova *et al.*, 2015, p.10). If carefully developed, a regulatory framework could underpin the achievement of (1) effective and efficient services in spite of variability in size and structure of communities, (2) regulatory independence but with appropriate industry understanding, (3) a balance among competing regulatory (and customer) expectations (4) transparent performance monitoring for benchmarking. Keeping compliance costs affordable would be a significant challenge but has

been accomplished in other jurisdictions. When fully developed, such a framework would influence risk management and the degree of risk sharing amongst WSS stakeholders a necessary step for promoting innovation while still providing a safety net for communities (Allan *et al.*, 2013).

5 Conclusion

Regionalisation, corporatisation, strategic private sector participation and improved regulatory frameworks all correlate with improved WSS internationally and in Australia but a range of external drivers (e.g. customer expectations, climate, and geography) are also critical to sustainable WSS. Recognising this complexity, particularly in large and dispersed states like Queensland, the Productivity Commission (PC 2011b, p.123) urged a cautious approach to reform including assessment of:

- the number of discreet schemes and network density and length of each,
- distance between networks and scope/demand and ability for interconnection,
- volume of water/sewage supplied or treated and the size of the area served,
- climate and rainfall variability and the variability of sewage (wet weather) flows,
- geography, geology and topography of the region (to determine cost of connecting networks and pumping costs), and
- asset life cycles (given the long life-times of established assets).

These ‘environmental factors’, and particularly those influencing connectivity and customer density have been often identified as drivers of inefficiency for small utilities:

a major determinant of observed inefficiency is the influence of the number of properties served and the amount of water supplied. This is perhaps because at least some utilities are obliged to operate at a more or less sub-optimal scale. One possibility is ‘lumpy’ investment in infrastructure (pipelines, dams, treatment plants). For instance, capital requirements may incorporate excess capacity to cover anticipated change over the lifetime of an asset. Further, as a physical network industry, it is difficult for these utilities to trade surplus capacity with any but geographically proximate utilities (Worthington, 2011, p. 85).

Extrinsic drivers also complicate any assessment of the efficiency of WSS. For example, a raft of econometric studies have sought to compare WSS efficiency (see reviews by Coeli and Walding, 2006; Walter *et al.*, 2009; Abbott and Cohen, 2009; Worthington, 2010; Cunningham, 2013; Vilanova *et al.* 2015) and attempt to control for fixed environmental drivers. However, data availability can be a significant problem and the methods may “not adequately reflect the operating environment or other exogenous influences” (Byrnes *et al.*, 2010, p. 453 and see Cunningham, 2013). These limitations are likely responsible for the “somewhat startling variability” found across different studies (Worthington, 2010, p. 11). A recent Australian study questioned technical aspects of past analyses and adopted a modified approach but it is clear that further analysis using more detailed data sets that include small service providers are needed to fully understand the impact of extrinsic cost drivers.

Despite these limitations, many studies have concluded that larger and more corporatised models (e.g. the regional, state owned water utilities in Victoria) are more efficient than smaller local government WSS providers. This is often assumed to result from structural arrangements such as independent boards, professional executives and arms-length operation (e.g. Byrnes *et al.*, 2009 p. 168) but with little or no supporting evidence for the conclusions. Furthermore, it is telling that some small local government utilities are often ranked statistically as industry leaders (see e.g. Worthington, 2011, Worthington and Higgs 2015; Ananda, 2015). The studies thus demonstrate that size and ownership are important but not sole determining factors for successful WSS while the ‘noise’ created by extrinsic drivers may in fact be the keys to success or failure. Consequently, poor average performance by local governments overshadows significant variation in efficiency including that of industry-leading councils. The conclusion that ‘bigger is always better’ is not borne out by statistical analysis as yet.

Notwithstanding these limitations, there is sufficient evidence regional, corporatised WSS providers perform better than smaller ones on average. It is plausible that efficiency gains result from the stricter regulatory controls and larger, corporatised form. However, the exemplary performance of at least some local governments indicates that other factors are equally or more important. These findings confirm what has been demonstrated in the current review, namely that common ‘success factors’ do not guarantee sustainability despite being clearly linked with enduring models.

Many of the international trends identified in this review have already impacted the south east corner of Queensland during the lurching restructures of the past seven years. The region now has three corporatised utilities, two of which are owned jointly by councils and three local government utilities which are at least partly commercialised. Outsourcing is common across all utilities and all are subject to an economic regulatory framework which was introduced during the reforms and is still being perfected. As the region is still recovering from this period, further time is required before the real impacts of these changes can be assessed.

For regional Queensland, it is likely that exogenous drivers will be more influential, particularly because of the isolation and small size of many WSS. Across the state, two thirds of potable schemes service towns with fewer than 1000 residents and 50% service fewer than 500 people. These communities may be separated by up to one hundred kilometres and their low customer density diminishes opportunities for economies of scale even after regionalisation. It is a simple fact that small and remote WSS often fail to be efficient, lack economies of scale and can’t afford cost-recovery pricing (Haider *et al.*, 2014a). This remains true regardless of the governance or management model under which the WSS owners operate and will be critical to the sustainability of regional Queensland.

Byrnes *et al.*, (2010, p. 441) noted that “approximately 70% of Australia’s population are serviced by 26 utilities, while the 200 smallest utilities collectively services only 3 million customers. This implies that utilities with fewer than 10,000 connections exist primarily in order to provide essential services and the efficiency of their operations should not be scrutinised.” While this conclusion may be appropriate from the point of view of economic

efficiency analyses, it is often the case that scrutiny of small and unsustainable communities drives reform (e.g. AECOM, 2010, NWC, 2011, and see Gonzalez-Gomez et al., 2014, p. 2):

There is a lack of resources in the smaller municipalities, inadequate cooperation among municipalities, a complex and inefficient administrative structure, a lack of rules and guidelines for technical management, laxity in the water quality controls, and absence of transparency, and low levels of citizen participation. In summary, we believe that beyond the existing public private controversy surrounding this industry in Spain, more fundamental problems associated with the organization and regulation of the industry should be addressed. The impact of ownership change may be marginal compared with these alternative reforms”.

In regional Queensland sustainability of small WSS is increasingly being threatened by the stock of post-war infrastructure that is approaching the end of its useful life. In 2009 the century-long partnership between state and local government for co-investment in WSS assets ended abruptly leaving local governments to bear these costs alone. Small towns that are unable to fund operations and maintenance let alone capital replacement have become dependent on increasingly infrequent and haphazard government funding as their only other alternatives are unsustainable borrowing or cross-subsidisation within their local government’s budget.

Rouse (2009, p. 139) criticised local government management of WSS suggesting that “the symptoms of failure are an increasing trend towards different models and the pleas of local government for ‘federal’ funds for refurbishing ageing infrastructure.” Small Queensland councils will increasingly find themselves in exactly this situation. However, Rouse’s suggested solution of privatisation is also inapplicable because most of these struggling schemes will never be profitable.

Regionalisation, commercialisation and stronger regulatory frameworks will provide benefits to even the smallest communities but can only form part of the solution and must somehow avoid inequitable cost-shifting, unnecessary transaction costs and alienation of rural customers. Sustaining WSS to the numerous small and isolated towns across the vast areas of regional Queensland is possible only through joint local and state government action that engages customers to fully deal with the diverse externalities and cost drivers of Queensland’s regional water sector.

6 References

- Abbott, M. and Cohen, B. 2009 Productivity and efficiency in the water industry. *Utilities Policy*, **17**: 233–244.
- ABC 2014 Are NSW water reforms ‘privatisation by stealth’. ABC online news story 3 October 2014. Available online at <http://www.abc.net.au/news/2014-10-03/are-nsw-water-reforms-privatisation-by-stealth/5790116>. Accessed 20/3/2015.
- ABC 2015 Privatisation of WA water utility stokes service delivery fears. Australian Broadcasting Corporation article 29 January 2015. Available online: <http://www.abc.net.au/news/2015-01-29/fears-over-wa-water-corp-service-privatisation/6055854>. Accessed 5/2/2015.
- ACTEW Water 2015 *New name for Canberra’s water and sewerage utility announced*. Icon Water. Available online at <http://www.actew.com.au/About/A-new-chapter.aspx>. Accessed 10/2/2015.
- ADB 2013 Indonesia water supply and sanitation sector assessment, strategy, and road map. Asian Development Bank, December, 2013.
- AECOM 2010 *Review of regional water quality and security*. Report prepared for Infrastructure Australia, 2010.
- Albon, R. and Decker, C. 2015 *International insights for the better economic regulation of infrastructure*. Australian Competition and Consumer Commission (ACCC)/Australian Energy Regulator (AER) Working Paper Series. Working Paper No. 10, March 2015. Commonwealth of Australia, Canberra.
- Allan, R. Jeffrey, P. Clarke, M. and Pollard, S. 2013 The impact of regulation, ownership and business culture on managing corporate risk within the water industry. *Water Policy* **15**: 458–478.
- Almansi, F., Hardoy, A. and Hardoy, J. 2010 *Improving water and sanitation provision in Buenos Aires. What can a research-oriented NGO do?* Human Settlements Programme. International Institute for Environment and Development, London.
- Ananda, J. 2014 Evaluating the performance of urban water utilities: Robust nonparametric approach. *J. Water Resource Planning and Management* **140(9)**: 04014021.
- Armstrong, I. and Gellatly, C. 2008 *Report of the Independent Inquiry into Secure and Sustainable Urban Water Supply and Sewerage Services for Non-Metropolitan NSW*. Sydney, 2008.

- Barraque, B. 2009 The development of water services in Europe: From diversity to convergence? In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- BBC 2014 Water charges: Almost 100 protests across Republic of Ireland. British Broadcasting Corporation News Article 1 November 2014. Available online at <http://www.bbc.com/news/world-europe-29859942>. Accessed 3/1/2015.
- Beecher, J.A. and Kalmbach, J.A. 2013 Structure, regulation, and pricing of water in the United States: A study of the Great Lakes region. *Utilities Policy* **24**: 32-47.
- Blyth, A. 2015 Simplicity in water regulation a worthy goal. *The Canberra Times* April 19, 2015.
- Braadbaart, O. 2009 North-South transfer of the paradigm of piped water: The role of the public sector in water and sanitation services. In: *Water and Sanitation Services: Public Policy and Management*, edited by Castro, J.E and Heller, L. Routledge, May 2012.
- Byrnes, J., Crase, L., Dollery, B.E. and Villano, R. 2009 An analysis of the relative efficiency of wastewater utilities in non-metropolitan New South Wales and Victoria. *Australasian Journal of Regional Studies* **15(2)**: 153-169.
- Byrnes, J., Crase, L., Dollery B.E. and Villano, R. 2010 The relative economic efficiency of urban water utilities in regional New South Wales and Victoria. *Resource and Energy Economics* **32(3)**: 439–455.
- Byrnes, J. 2013 A short institutional and regulatory history of the Australian urban water sector. *Utilities Policy* **24**:11-19.
- Cade, L. 2015 Australia's infrastructure: The case for change. *Water*, February 2015 **42**:42-45.
- Coelli, T. and Walding, S. 2006 Performance measurement in the Australian water supply industry: A preliminary analysis. In: *Performance Measurement and Regulation of Network Utilities* edited by Coelli, T. and Lawrence, D. Edward Elgar, Cheltenham, 29–62.
- Cuadrado-Ballesteros, B., García-Sánchez, I., and Prado-Lorenzo, J. 2013 Effect of modes of public services delivery on the efficiency of local governments: A two-stage approach. *Utilities Policy* **26**: 23-35.
- Cunningham, M.B. 2013 Productivity benchmarking the Australian water utilities. *Economic Papers* **32**:174-189.
- DECLG 2012 *Position Paper: Reform of the water sector in Ireland*. Department of Environment, Community and Local Government. Irish Government, Dublin, 2012.

- DECLG 2013 *Report of the interdepartmental working group on affordability measures*. Department of Environment, Community and Local Government, Irish Government, Dublin, December 2013.
- Devkar, G.A., Mahalingam, A., Deep, A. and Thillairajan, A. 2013 Impact of private sector participation on access and quality in provision of electricity, telecom and water services in developing countries: A systematic review. *Utilities Policy* **27**: 65-81.
- Dietrich, B., Gayer, J., Grenzler, G., and Kovacs, R. 2013 *The Hungarian water and sanitation industry in the 21st century*. Hungarian Investment and Trade Agency.
- DTF 2014 Review of the role of the Tasmanian Economic Regulator. Department of Treasury and Finance, Government of Tasmania, Hobart.
- DWQR 2004 *Drinking water quality in Scotland 2003*. Annual Report by the Drinking Water Quality Regulator, 2004.
- DWQR 2005 *Drinking water quality in Scotland 2004*. Annual Report by the Drinking Water Quality Regulator, 2005.
- DWQR 2007 *Drinking water quality in Scotland 2006*. Annual Report by the Drinking Water Quality Regulator, 2007.
- DWQR 2014 *Drinking water quality in Scotland 2013*. Annual Report by the Drinking Water Quality Regulator, 2014.
- Estache, A. and Saussier, S. 2014 *Public-private partnerships and efficiency: a short assessment*. CESIFO DICE Report 3/2014 (September).
- Faust, A.K. and Baranzini, A. 2014 The economic performance of Swiss drinking water utilities. *J Prod Anal* **41**: 383–397.
- Fearon, R.J. 2012 *Queensland Regional Water Alliance scoping paper. Parameters of the review program and institutional models*. LGAQ, Brisbane, June 2012
- Filippini, M., Hrovatin, N., Zoric, J. 2008 Cost efficiency of Slovenian water distribution utilities: An application of stochastic frontier methods. *Journal of Productivity Analysis* **29(2)**: 169-182.
- Foster, V. 2005 Ten years of water service reform in Latin America: Toward and Anglo-French model. *Water supply and sanitation sector board discussion paper series*. Paper No. 3, January 2005. World Bank, Washington DC.
- Frontier Economics 2014 *Improving economic regulation of urban water*. Report prepared for the Water Services Association of Australia, Sydney, 2014.

- Global Water Intelligence 2015 Online information resource, available at <http://www.globalwaterintel.com/pinsent-masons-yearbook/2010-2011/part2/29/>. Accessed 12/2/2015.
- Gonzalez-Gomez, F, García-Rubiom M.A., and Gonzalez-Martínez, J. 2014 Beyond the public- private controversy in urban water management in Spain. *Utilities Policy* **31**: 1-9.
- Haider, H., Sadiq, R. and Tesfamariam, S. 2014a Performance indicators for small- and medium-sized water supply systems: a review. *Environmental Reviews* **22(1)**: 1-40.
- Haider, H., Sadiq, R. and Tesfamariam, S. 2014b Selecting performance indicators for small and medium sized water utilities: Multi-criteria analysis using *ELECTRE* method. *Urban Water Journal*. Published online: 14 Apr 2014.
- Hall, D., Lanz, K., Lobina, E. and de la Motte, R. 2004 *Watertime*. D7: International Context. PSIRU, Business School, University of Greenwich, Park Row, London SE10 9LS, U.K.
- Harper, I., Anderson, P., McCluskey, S. and O'Bryan, M. 2015 *The Australian Government competition policy review. Final Report, March 2015*. Commonwealth of Australia, Canberra, 2015.
- Heller, L. 2009 Water and sanitation policies in Brazil: Historical inequalities and institutional change. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- Hillis, p. and Fonti, J. 2015 Opportunity or bust? Infrastructure financing in the water industry. *Water* **42(2)**: 74-76.
- Hukka, J.J. and Katko, T.S. 2009 Complementary paradigms of water and sanitation services: Lessons from the Finnish Experience. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- IA 2013 *National Infrastructure Plan*. Infrastructure Australia, Commonwealth of Australia, Canberra, June 2013.
- Irish Government 2014 *Water Services Strategic Plan Direction 2014*. Direction under Section 33(3) of the water services (No. 2) Act 2013.
- Juuti, P.S. and Katko, T.S. 2005 *Watertime D45: City in Time*. PSIRU, Business School, University of Greenwich, Park Row, London SE10 9LS, U.K.
- JWWA 2014 *Water supply in Japan 2014*. Japan Water Works Association, Kyoto, 2014.
- Lehane, S. 2015 *Australia's water security Part 3: Reform and governance*. Future Directions International, Strategic Analysis Paper, 5 February 2015.
- Kris, J. 2003 Water supply in Slovakia. *J Water SRT – Aqua* **52**: 355-367.

- Kris, J. and Skultetyova, I. 2009 Drinking Water Supply in Slovakia. International Symposium on Water management and Hydraulic Engineering. Paper A47. Available online at <http://wmhe.gf.ukim.edu.mk/Downloads/PapersTopic2/A47-Kris-Skultetyova.pdf>, accessed 4/4/2015.
- Kuks, S. 2004 The evolution of the water regime in the Netherlands. *In: the Evolution of National Water Regimes in Europe. Transitions in Water Rights and Water Policies.* Kissling-Naf, I. and Kuks, S. eds. Environment and policy. Springer Science+ Business Media, Dordrecht, 2004.
- KPS 2009 *Report on measures to cope with over-fragmentation in the water supply and sanitation sector.* Kommunalkredit Public Consulting , OECD, September 2009.
- LGRC 2007 Report of the Local Government Reform Commission. Volume 1. State of Queensland July 2007, Local Government Reform Commission, Brisbane, 2007.
- Lobina, E., Kishimoto, S. and Petitjean, O. 2014 *Here to stay: Remunicipalisation as a global trend.* Public Services International Research Unit (PSIRU), Transnational Institute (TNI) and Multinational Observatory, November 2014.
- Lonborg, R. 2005 *Regulation, organisation and efficiency: Benchmarking of publically and privately owned utility companies.* Paper prepared for the 3rd ECPR Conference, Comparative Perspective on Public Service Utilities, Budapest 8th-10th of September 2005.
- Marques, R., Berg, S., Yane. S. 2014 Nonparametric Benchmarking of Japanese Water Utilities: Institutional and Environmental Factors Affecting Efficiency. *J. Water Resour. Plann. Manage.* **140(5)**: 562–571.
- Massarutto, A., Antonioli, B., Ermano, P. 2013 Assessing the impact of water service regulatory reforms in Italy: a multidimensional approach. *Water Policy* **15**: 1046–1063.
- Matthews, K. 2015 Water reform needs to be back on the national agenda. *Focus* **189**: 3-4.
- Mauch, C. and Reynard, E. 2004 The evolution of the water regime in Switzerland. *In: the Evolution of National Water Regimes in Europe. Transitions in Water Rights and Water Policies.* Kissling-Naf, I. and Kuks, S. eds. Environment and policy. Springer Science+ Business Media, Dordrecht, 2004.
- McDonald, D.A. 2012 Remunicipalisation works! *In: Remunicipalisation: Putting water back into public hands.* Edited by Pigeon, M. *et al.* Transnational Institute, Amsterdam, 2012.
- McKay, J. 2005 Water institutional reforms in Australia. *Water Policy* **7**: 35-52.
- MHLW 2015 *Overview of water supply services.* Ministry of Health, Labour and Welfare, Japan. Available online at

http://www.mhlw.go.jp/english/policy/health/water_supply/1.html. Accessed: 1/3/2015.

AFMAFEWM 2015 Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management. Available online at: <http://www.bmlfuw.gv.at/en.html>. Accessed 3/4/2015.

MRC 2013 *Water Alliance wins top award for collaboration*. Mackay Regional Council Press Release 24 April 2013. Available online at: http://www.mackay.qld.gov.au/about_council/news_and_media/media_releases/2013_media_releases/water_alliance_wins_top_award_for_collaboration. Accessed 20/1/2015.

NOW 2011 *2009-10 NSW Water supply and sewerage Performance monitoring report*. New South Wales Office of Water Department of Trade, Industry, Regional Infrastructure and Services, Sydney, 2011.

NWC 2009 *Australian water reform 2009: Second biennial assessment of progress in implementation of the National Water Initiative*. National Water Commission, Canberra, 2009.

NWC 2011a *Urban Water in Australia: Future Directions*. National Water Commission, Canberra, 2011.

NWC 2011b, *The National Water Initiative—securing Australia’s water future: 2011 assessment*. National Water Commission, Canberra, 2011.

NWC 2011c *Review of pricing reform in the Australian water sector*. National Water Commission, Canberra, April 2011.

NWC and WSAA 2014 *National Performance Report 2012-13: Urban Water Utilities*, National Water Commission and Water Services Association of Australia, Canberra, 2014.

OECD 2003 *Public-Private Partnerships in the Urban Water Sector*. OECD Policy Brief April 2003.

OECD 2004 *Competition and regulation in the water sector*. DAFNE/COMP(2004)20. OECD Policy Round Tables, Paris, 2004.

OECD 2006 *Guidelines for performance-based contracts between municipalities and water utilities in Eastern Europe, Caucasus and Central Asia (EECCA)*. OECD, Paris, 2006.

Oelmann, M. and Czichy, C. 2013 *Water service provision as a natural monopoly*. Intereconomics forum on the regulation of water services in the EU. Volume 48 (3), May-June 2013.

- Ouda, O.K.M., Al-Waked, R.F. and Alshehri, A.A. 2014 Privatisation of water-supply services in Saudi Arabia: A unique Experience. *Utilities Policy* **31**: 107e113
- OTTER (Office of the Tasmanian Economic Regulator) 2011 *Tasmanian Water and Sewerage State of the Industry Report 2009-10*. Tasmanian Government, Hobart, 2011.
- PC 2011a *Australia's Urban Water Sector*. Report No. 55, Final Inquiry Report, Volume 1, Productivity Commission, Canberra, 2011.
- PC 2011b *Australia's Urban Water Sector*. Report No. 55, Final Inquiry Report, Volume 2. Productivity Commission, Canberra, 2011.
- Pazi, S. Duygun, M., Ausina, E.T. and Zambelli, S. 2013 *Efficiency of water utilities: Does local public ownership matter? Evidence from Italy*.
- Peda, P., Grossi, G. and Liik, M. 2013 Do ownership and size affect the performance of water utilities? Evidence from Estonian municipalities. *Journal of Management & Governance* **17(2)**: 237-259.
- Pezon, C. 2009 Decentralisation and delegation of water and sanitation services in France. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May, 2012.
- Pietila, P., Gunnarsdottir, M.J., Hjorth, P. and Nielsen, S.B. 2009 Decentralised services: The Nordic experience. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May, 2012.
- PWC 2011a Review of urban water quality regulation in Australia, *Waterlines Report Series no. 47*, National Water Commission, Canberra, 2011.
- PWC 2011b *Irish Water: Phase 1 Report*. A report prepared for the Department of the Environment Community and Local Government. Price Waterhouse Coopers, Dublin, November 2011.
- QT 2010 *Commercialisation of Government business activities in Queensland. Policy framework*. Queensland Treasury, Brisbane, 2010.
- Rosenberg, M.W. 2009 'From east to western sea': Canada – a country of national abundance and local shortages. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- Rouse, M. 2009 The market-centered paradigm. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- Rudolph, K.U. Gregarek, D. and Harback, M. 2007 Private sector participation in Europe and South East Asia: Past present and future developments in the water market. *Privatisation and Regulation – On the co-evolution of technology, policy and institutions*. Delft University of Technology, The Netherlands, 22 and 23 March 2007.

- Sangare, I. and Larrue, C. 2004 The evolution of the water regime in France. *In: the evolution of national water regimes in Europe. Transitions in water rights and water policies. Environment and policy.* Edited by Kissling-Naf, I. and Kuks, S. Springer Science+ Business Media, Dordrecht, 2004.
- Sauri, D., Olcina, J. and Rico, A. 2009 The state of urban water supply and sanitation in Spain: Issues, debates and conflicts. *In: Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- Schott, K. 2015 Should urban water utilities be privatised? *Water*, February 2015, pp. 6-8.
- Scottish Government 2008 The Scottish Executive. 'Water Services Bill – The Executive's Proposal'. Scottish Government, Edinburgh, 2008.
- Scottish Government 2014 News Article available at:
<http://news.scotland.gov.uk/News/Billions-to-be-invested-by-Scottish-Water-109c.aspx>.
 Accessed on 18/12/2014.
- Scottish Water 2009 Second draft business plan: March 2009. Draft special factors' submission strategic review of charges 2010-2014.
- Scottish Water 2010 Water Resource Plan 2009 – Summary document. Scottish Water, Edinburgh, 2010.
- Seppala, O.T. and Katko, T.S. 2009 Management and organization of water and sanitation services: European experiences. *In: Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- Singh, M.R., Mittal, A.K. and Upadhyay, V. 2011 Benchmarking of North Indian urban water utilities. *Benchmarking* **18 (1)**: 86-106
- Sørensen, E.M. 2010 *The Danish water sector reform – economic efficiency and central-local relations*. Danish Institute of Government Research, Copenhagen, July 2010.
- Strachan, S. 2012 Water privatisation issue divides Gympie councillors. *The Gympie Times*. 19th October 2012.
- Swyngedouw, E. 2009 Troubled waters: The political economy of essential public services. *In: Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- The Guardian 2015 Water privatisation: a worldwide failure? *The Guardian*. Available online at: <http://www.theguardian.com/global-development/2015/jan/30/water-privatisation-worldwide-failure-lagos-world-bank>. Accessed 25/4/2015.

- TNI 2014 *180 cities take back public control of water showing remunicipalisation is here to stay*. Online article available at <http://www.tni.org/pressrelease/180-cities-take-back-public-control-water-showing-remunicipalisation-here-stay>. Accessed 5/4/2015.
- Torregrosa Armentia, M.L. and Jimenez Cisneros, B. 2009 Challenges facing the universal access of water and sanitation in Mexico. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- TWD 2009 The water dialogues. Indonesia contextual analysis in water supply and sanitation sector. *The Water Dialogues Program*. Available online: <http://www.waterdialogues.org/documents/8.6ContextualAnalysis.pdf>. Accessed 1/3/2015.
- Uddameri, V. and Singh, V.P. 2009 The US experience on water supply and sanitation: The interaction between public policy and management. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.
- USEPA 2009 Water on tap. What you need to know. United States Environmental Protection Agency, Washington, 2009.
- USEPA 2010 Factoids: Drinking Water and Ground Water Statistics for 2009. United States Environmental Protection Agency, Washington, 2010.
- Varone, F and Aubin, D. 2002 *The evolution of the national water regime in Belgium*. Euawareness project, April 2002.
- Varone, F and Aubin, D. 2004 The evolution of the water regimes in Belgium. In: *the Evolution of National Water Regimes in Europe. Transitions in Water Rights and Water Policies*. Edited by Kissling-Naf, I. and Kuks. Springer Science+ Business Media, Dordrecht, 2004.
- Vidal, J. 2015 Water privatisation: A worldwide failure? *The Guardian*, 31 January 2015. Available online: <http://www.theguardian.com/global-development/2015/jan/30/water-privatisation-worldwide-failure-lagos-world-bank>. Accessed 12/3/2015.
- Vilanova, M.R.N., Filhob, P.M. and Balestierib, J.A.P. 2015 Performance measurement and indicators for water supply management: Review and international cases. *Renewable and Sustainable Energy Reviews* **43**: 1–12.
- Vinnari, E. M. and Näsi, S. 2008 Creative accrual accounting in the public sector: ‘Milking’ water utilities to balance municipal budgets and accounts. *Financial Accountability & Management* **24(2)**: 97-116.
- Walter, M.; A. Cullmann, C. von Hirschhausen, R. W. and Zschille, M. 2009 Quo vadis efficiency analysis of water distribution? A comparative literature review. *Utilities Policy* **17(3-5)**: 225-232.

- Watertime 2005 Web resources from the Water Time program. Available online at <http://www.watertime.net>. Accessed 12/1/2015.
- WICS 2014 *Scottish Water's Performance 2013-2014*. Water Industry Commission for Scotland, Edinburgh, 2014.
- WICS 2015 Water Industry Commission for Scotland. Available online at http://www.watercommission.co.uk/view_Our%20role%20and%20remit.aspx. Accessed 3/1/2015.
- Woodbury, K. and Dollery, B.E. 2004 Efficiency measurement in Australian local government: The case of New South Wales municipal water services. *Review of Policy Research* **21(5)**: 615–636.
- Worthington, A.C. 2010 *A review of frontier approaches to efficiency and productivity measurement in urban water utilities*. Griffith Business School Discussion Papers Economics No 2010-10, Series Editor D.T. Nhuyen. Griffith University, Brisbane, 2010.
- Worthington, A.C. 2011 *Productivity, efficiency and technological progress in Australia's urban water utilities*. Waterlines Report Series No 62, October 2011 National Water Commission, Commonwealth of Australia, Canberra, 2011.
- Worthington, A.C. 2014 A review of frontier approaches to efficiency and productivity measurement in urban water utilities. *Urban Water J.* **11**: 55-73.
- Worthington, A.C. and Higgs, H. 2014 Economies of scale and scope in Australian urban water utilities. *Utilities Policy* **31**: 52-63.
- WSAA 2010 Implications of population growth in Australia on urban water resources. *Occasional paper no. 25*, Water Services Association of Australia, Canberra.
- Zuo, J. and Gan, L. 2009 Water and sanitation services in China: Current problems and potential solutions. In: *Water and Sanitation Services: Public Policy and Management*, Edited by Castro, J.E and Heller, L. Routledge, May 2012.