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Water Tight 2.0

The top trends in the global water sector

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Foreword

Welcome to the second edition of *Water Tight*. The central theme of this edition is innovation. It is about how utilities and industries explore new ways to tackle supply-side, demand-side, regulatory or business-related challenges. The report focuses on the water sector from a global perspective, with country specific examples that provide a view of how some trends could work in a local setting.

Since Deloitte published *Water Tight 2012*, governments and businesses have made progress in understanding and appreciating the value of water for economic growth and business use. While the road ahead is long, since the last edition, the number of governments and companies that are now embracing water stewardship practices and focusing on sustainable water management has grown.

The sector is also starting to explore the power of data analytics. Data-driven insights have great potential to transform the way consumers, the government and utilities think about water as a resource and how the industry plans, invests and manages water infrastructure in the future.

Driven by regulatory requirements and their users' experiences, water utilities are now starting to focus on the customer in a number of countries with privatized water industries. This is also the direction of travel in countries where water is supplied by municipal utilities, providing the private sector with new opportunities to enter the sector.

Water and sewerage companies across the world are coming under pressure to do more with less, putting operational efficiency measures to the top of their agenda. This also opens up new opportunities for businesses with a focus on providing solutions for more efficient or sustainable water provision or use.

As the impact of climate change and pollution on hydrological cycles becomes better understood, a number of countries may look to tighten water regulatory standards on the provision of water and sewerage services. With more interest from governments and businesses to adopt water stewardship principles, utilities may also explore innovative financing solutions to fund infrastructure investments.

All of the themes discussed in this report are closely connected. For example, it is impossible to talk about operational efficiency without considering the opportunities that data analytics offer in this area.

Our themes have been developed in consultation with senior practitioners from Deloitte member firms around the world. I would like to thank them for their help.

James Leigh
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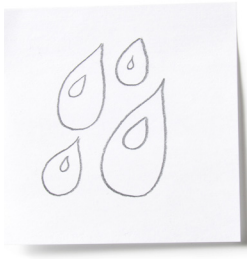
Setting the scene



Water scarcity, changing demographics and operational efficiency are top issues for the global water sector, which are amplified by the unpredictable impact of climate change. These challenges provide the background to this report.

Demand for water continues to rise. According to The Organisation for Economic Co-operation and Development (OECD), by the middle of the century water demand will increase by 55 percent compared with 2015 levels.[1] This increase will mainly be driven by population growth. Since *Water Tight 2012*, the world's population has grown by 300 million and the United Nations (UN) estimates that it will further increase by another 2.4 billion people between 2015 and 2050,[2] with the world's total population reaching 9.7 billion in 2050. Urbanization, dietary and lifestyle changes will also accelerate the growth in demand for water. With rapid population growth expected in parts of Asia, which are already under water stress, these areas face acute water scarcity problems. The intense competition between water users means that as early as 2030, the planet may face a 40 percent water supply shortfall assuming business as usual.[3]

Declining water quality has also grown to be a global concern. It can directly influence the cost of providing water by utilities, reduce the volume of water available for use, and indirectly affect human health. Water pollution mostly occurs as a result of agricultural run-off, domestic sewage and industrial effluents. The long-term impact of personal care products and pharmaceuticals, such as painkillers and antibiotics, on water cycles is a new area of concern that is rapidly gathering interest among the scientific community resulting in changes to public policy.

Water loss through leakage is a major issue both in the developed and developing world. In England and Wales, on average 22 percent of water was lost through pipe leakage every day in 2013/14, a number that has been on the rise since the last publication of *Water Tight*.[4] The majority of leakage is due to aging infrastructure. To address this problem, Thames Water, an England and Wales water utility, started the Victorian Mains Replacement Program to replace 109 km of Victorian water mains across London and the Thames Valley.[5] A third of these water mains are over 150 years old, while half are over 100 years old.

The long-term impact of climate change is unpredictable, but many expect it to exacerbate water scarcity, watershed planning and make aging water infrastructure even more vulnerable to extreme weather conditions. Therefore the level of risk that climate change introduces is likely to make water cycle, infrastructure and demand management even more complex and costly. The impact of climate change will also differ significantly from location to location. In some parts of the world droughts may set in and become more prolonged, such as the droughts experienced in California in recent years, while other regions will see more flash floods with devastating consequences on human life, businesses and infrastructure. Warmer weather will not only increase demand for water, rising sea levels and adverse weather patterns, but could also result in deep societal change, such as large-scale human migration.

Planning for the effects of climate change is difficult, as historical statistics may not help in predicting the future. While only a few governments are openly incorporating water-related risks into their plans, a broad coalition of governments, river basin organizations and businesses established the *Paris Pact on Water and Climate Change Adaptation (The Pact)* at the 2015 Paris Climate Change Conference.[6] *The Pact* aims to implement individual adaptation plans, strengthening water monitoring and measurement systems in river basins and promoting financial sustainability and new water systems management.

Ultimately, the world needs flexible and resilient water systems that anticipate and monitor changes in circumstances. Sustainable management techniques need to be implemented to protect water cycles and reduce the impact of human activity on them. These need to go hand-in-hand with optimizing water and wastewater provision and consumption, and will require closer collaboration between utilities, users and regulators to incentivize water conservation, reuse and recycling.

1 http://unesdoc.unesco.org/images/0023/002318/231823E.pdf

2 http://esa.un.org/unpd/wpp/Publications/Files/Key_Findings_WPP_2015.pdf

3 http://unesdoc.unesco.org/images/0023/002318/231823E.pdf

4 http://www.ccwater.org.uk/wp-content/uploads/2015/01/Company-performance-report.pdf

5 http://www.cityoflondon.gov.uk/business/commercial-property/utilities-and-infrastructure-/Pages/thames-water.aspx

6 http://newsroom.unfccc.int/lpaa/resilience/press-release-lpaa-resilience-1-paris-pact-on-water-and-climate-change-adaptation-announced/

1. The value of water

Water is our most precious resource. Access to it is a basic human right and water is crucial for human health and wellbeing, as well as economic performance and business growth.

It is also a finite and shared resource, therefore action by an individual, a business or a community can have a substantial impact on access to it by others.

How can this precious resource be protected and used sustainably by current and future generations? While the price for water could play an important part in managing demand and encouraging efficiency of provision, raising prices may not be the only or the right answer to address issues with water scarcity and quality decline. To help address the issue, there is a need to shift focus from managing water resources individually (either by private individuals, businesses or communities) to establishing water stewardship strategies that anticipate, manage and mitigate the potentially detrimental impact of water usage by a larger, closely-knit net of stakeholders. This approach moves away from the focus on the price of water to appreciating the value that water brings to both public and private enterprises.

A world of difference between price and value

The question of what the right price is for water has been long debated by policy makers, academics, utilities and the public. The World Bank has produced general principles that can guide determining the cost of water[7]:

Full supply cost	Covers the cost of supplying the water by the utility, including operational, maintenance and capital costs.
Full economic cost	Covers the full supply cost, the opportunity cost associated with alternative use of the water resource and the economic impact imposed by other users, as well as economic externalities. Economic externalities include, for example, the impact of upstream pollution on users further downstream.
Full cost	Covers the full economic cost and environmental externalities. Environmental externalities include impact on public health or ecosystem.

Most public and private utilities focus on recovering the full supply cost of water through tariffs or taxation. However, in many parts of the world there is a distinct disconnect between the price of water and its reduced availability as a resource. How should the price of water be set in these regions? Should it be left to the markets to determine, taking into account factors such as supply, demand and quality, which may lead to water being turned into a commodity? While free market principles may drive efficiency and effectiveness of provision and may well encourage conservation, recycling and reuse, they may also lead to only giving access to those who are able to afford it, and obstructing others in their basic human right of access because of its high price. Commoditization could also distract from focusing on making the water cycle and water ecosystem resilient and sustainable.

So how does the industry find a balanced price that reflects the true cost of water, meets policy requirements (such as affordability and quality) and encourages efficient water provision? The answer may lie in not focusing on the cost and price at all, but in understanding the value of water for economic development and business growth. This would shift thinking from managing water resources on an individual (private individuals, businesses or communities) level to following water stewardship principles that appreciate water scarcity and environmental concerns, affordability issues and create opportunities for businesses.

The value of water for public sector

The State of California in the United States (US) illustrates the impact of water scarcity on economic development. The state is facing severe water scarcity due to climate change and increased competition for water.[8] California's governor announced mandatory rationing of water to preserve supplies for agricultural, energy, commercial, and residential use.[9] Water scarcity is now affecting both food and energy production in California, with measurable impacts on the state economy and on private business. The drought is estimated to have caused an economic loss to the state economy of about US$3 billion in 2015 – an increase from about US$2.2 billion in 2014.[10] According to Richard Howitt, from the University of California, the state's agricultural sector lost approximately 17,000 jobs in 2014 and will experience "mid-20,000" job losses in 2015.[11]

7 http://info.worldbank.org/etools/docs/library/80637/IWRM4_TEC02-WaterAsSocialEconGood-Rogers.pdf

8 Ker Than, "Causes of California drought linked to climate change, Stanford scientists say," Stanford, September 30, 2014, http://news.stanford.edu/news/2014/september/drought-climate-change-092914.html.

9 Ben Adler, "Brown issues mandatory water conservation order for California," Capital Public Radio, April 1, 2015, http://www.capradio.org/articles/2015/04/01/brown-issues-mandatory-water-conservation-order-for-california/

10 Jeff Daniels, "2014 California drought was bad. 2015 will be worse," CNBC, March 3, 2015, http://www.cnbc.com/id/102472848.

11 Ibid.

Water scarcity is also affecting the energy sector in California. Typically, natural gas and hydropower are the state's top two sources of energy. However, as a result of water scarcity, lessened river flows have compromised the capacity to generate hydroelectricity, increasing the state's reliance on natural gas for electricity and leading to both higher prices and increased greenhouse gas emissions. According to a recent Pacific Institute report, between October 2011 and October 2014, California's ratepayers spent US$1.4 billion more for electricity than in average years because of the drought-induced shift from hydropower to natural gas.[12]

The value of water in the private sector

Businesses in sectors other than food and energy are also directly or indirectly affected by water scarcity in California. Elsewhere, many international companies are planning to expand or grow in water-stressed countries, such as China, India and parts of Africa. These companies are likely to face increased public and governmental scrutiny over their water management practices.

However, there is a general lack of recognition of risk factors associated with access to water and many companies are not considering developing or changing their water management practices. According to a report by VOX Global and the Pacific Institute, 79 percent of US companies say they currently face water challenges, while 84 percent claim they will face issues in the next five years, but 70 percent believe that their current investment to deal with water issues is sufficient for the future.[13] Attitudes to water risk are expected to change in the future, especially if more companies report a detrimental impact from water-related issues on their business: companies included in the *CPD Global Water Report 2015* this year reported a financial impact of US$2.5 billion on their business.[14]

Although water is a shared resource, most businesses only focus on their own water management practices, without considering the impact of their actions on other stakeholders in the river basin. According to the *CDP Global Water Report 2015*, only 24 percent of responding companies require their suppliers to report water risk or include suppliers in their corporate water risk assessment.[15] Barely a quarter look at water issues in a river basin context and only 12 percent consider a broad range of river basin stakeholders.[16]

There are, however, plenty of companies – in particular in the food and beverage industries – that have made significant progress in recent years to better understand the value of water on their businesses and develop water stewardship strategies to manage risk and take advantage of opportunities arising from water scarcity.

The value of water for businesses and water stewardship

For many companies, water is a minor business expense. But disruption to supplies can quickly prove to a company that the value of water can significantly exceed the cost of water access.

The value of water for a business is associated with a number of risks:

	Value	Risk
Tangible value	Business continuity	Scarcity of water supplies can disrupt normal operations and lead to a loss that can be quantified in economic terms.
Intangible value	Social licence to operate	A business risk that many mining, oil and gas, food and beverage companies know too well. Social licence to operate is no longer a simple permit, but a complex and potentially volatile relationship with the many local stakeholders that share the water basin. Withdrawal of the licence to operate means that the company needs to stop operation at that location.
	Reputation and brand value	Reputation and brand form part of a company's assets. Inability to operate sustainably may cause reputational risks and can damage the brand value.

Companies that understand the tangible and intangible value of water to their business, adopt practices that safeguard the long-term availability of clean water for all the stakeholders in the watershed. These practices are now commonly called water stewardship practices.

12 Peter Gleick, Impacts of California's ongoing drought: Hydroelectricity generation, March 17, 2015, http://pacinst.org/publication/impacts-of-californias-ongoing-drought-hydroelectricity-generation/.

13 http://voxglobal.com/wp-content/uploads/Bridging-Concern-with-Action-Are-US-Companies-Prepared-For-Looming-Water-Challenges_2014-04-01PM.pdf

14 https://www.cdp.net/CDPResults/CDP-Global-Water-Report-2015.pdf

15 Ibid.

16 Ibid.

Companies that adopt water stewardship strategies should be able to anticipate, manage and mitigate a number of risks such as increasing water costs, changing regulatory landscape or disruption of physical supplies. Following water stewardship practices may also help companies to reduce water intake or develop new products and services to meet demand driven by water scarcity. In addition, publicizing the company's water stewardship efforts may further enhance its reputation and maintain its license to operate. As Figure 1 demonstrates, water stewardship can fuel business growth and these companies can create licence to grow.

Figure 1.

Source: Will Sarni, *Fuelling growth: You can't always buy what you need*, Deloitte University Press, 2014

Bottom line

Both private and public entities can better understand the value of water if they maximize the potential of internal and external data to deliver insights to drive their decisions. These insights then need to activate the ecosystem of stakeholders committed to addressing water quantity and quality issues to drive economic and business growth and social well-being. Simply put, better data for smart water strategies coupled with collective/aligned action to manage water risks and drive economic and business growth. This is the 21st century opportunity in valuing water. Let's move beyond thinking about the price of water.

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2. The value of data

The majority of water and sewerage companies across the world face similar challenges to businesses in other sectors: revenue growth, optimal operating margins, asset performance and resilience are key areas where stakeholders need constant reassurance. Making the right decisions in these areas is crucial.

At the same time, the world is becoming more complex and volatile. The number of stakeholders in the water sector is increasing and companies also need to consider new regulatory requirements and the impact of climate change, cyber threats and rising costs on the business. In this environment, making decisions is becoming ever more difficult: past history, experience and intuition no longer count as a guarantee for success.

To make the right decisions, the right people need to have access to the right information at the right time. For these insights to be discovered, companies need to maintain and protect their own data as an asset and make best use of the available external data.

The volume of data water and sewerage utilities collect worldwide has been rising sharply in recent years. This trend will only continue once smart meters and other technologies are rolled out on a wider scale. How can a water company ensure that it capitalizes on its existing data, and does not get caught up in the processing of it but creates an environment where decisions are driven by robust business intelligence?

This chapter highlights some of the data analytics challenges that water companies face, how they can be overcome and what opportunities the use of data analytics can open up for the water sector.

A flood of data…

The volume of data the water sector collects has increased dramatically in recent years. For example, utilities collect large volumes of data already including:

- flow, chemical concentration and laboratory data;
- water supply metering and customer usage data;
- engineering and construction data; and
- asset performance and maintenance data.

Remote sensing and on-the-ground technologies, along with the widespread adoption of geospatial analysis, have increased the sector's capacity to quantify and monitor water supplies and fluxes over large spatial scales. These technologies also increase the speed with which data is collected.

More recently, in-situ technologies have also emerged, including high-resolution water quality sensors, automated water meter networks and precision agriculture or precision farming solutions that primarily monitor hydrologic and meteorological variables such as soil moisture, precipitation events and snowpack levels. These provide the agricultural sector with better information to secure more 'crop per drop.'

Growth in the variety of data, particularly unstructured data, including web content, social content and crowdsourcing, is also changing the landscape of water data. For example, photos and tweets may be a greater source of local flood observations (the citizen scientist) or sentiment analysis which can help better understand reputational water-related risks.

…but not without its challenges

Until now, many utility departments collected data in silos, in some cases the same data set in a variety of formats that are often incompatible with each other. There are also examples for data duplication across the industry. Because many water utilities will only have elements of data governance capabilities, they often lack confidence in the quality of data and its suitability for analysis. Elsewhere, departments are reluctant to share data or unable to access it for timely analysis.

Efficient and effective use of data can also be considered an issue. Companies typically use a small proportion of data to perform particular tasks or to solve specific problems, but leave the vast majority of data unexploited. In many utilities, the inconsistency of data across the organization makes it difficult to aggregate data for company-level analysis and to extract more meaningful information. Utilities also face the issue of how to incorporate unstructured data consistently and effectively into their analysis.

Sharing data between utilities can be even more challenging and stand in the way of using data for making more informed decisions on a regional and national level, and beyond.

The water industry expects the volume of data utilities collect to grow dramatically once smart meters, the Internet of Things and more technology spreads in the sector.[17] Larger data sets will inevitably lead to challenges around data storage and data security – not issues that the water sector has had to deal with in the past. Issues around intellectual property will also rise: who has rights over the data – the owner of a sensor, the company that deploys a solution, or the owner of the property where the solution was deployed?

There is also the perception that data analytics is complex and therefore too difficult. Many water companies are also distracted by the hype that surrounds big data and Internet of Things: they are unsure when their data sets are too large or complex for traditional data processing applications to be adequate and how to apply big data analytics to their business.

The lack of understanding of the value that more effective data analysis can bring, can also prevent leadership support and stop water companies from investing in technologies and talent.

It is not just about the data – it is about the quality of decisions

Data analytics is more than just collecting, managing and analyzing data. It is really about improving the quality and speed of decision-making throughout the organization. It starts with identifying the business issue and focuses on finding and processing the right data to provide timely intelligence to help solve that problem.

As Figure 2 demonstrates, utilities need to:

1. Understand how they can become an insight-driven organization (IDO), which makes analysis, data and reasoning part of its decision-making process.

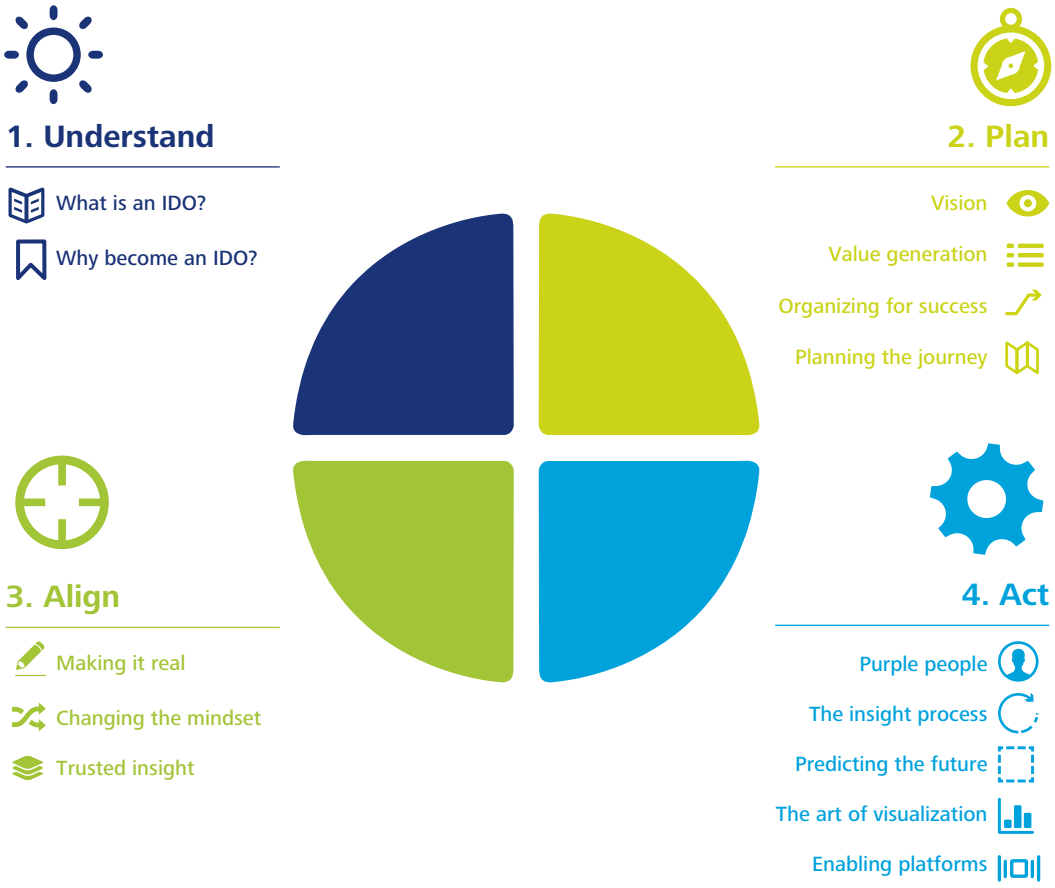
2. Decide what their goals and objectives are, what they need to achieve and what their priorities are. They should also decide who is responsible for the data analytics agenda within the company – some companies appoint a Chief Analytics Officer or Chief Data Officer – and finally plan the journey.

3. Align business and IT around the problem, start changing the way decisions are made to ensure insights are acted upon and ensure that data and analysis are accurate, trusted and assured.

4. Put it all into action by having the right team (purple people – talent with technical and analytical (red), as well as, business and communication (blue) skills), establish processes to test and industrialize analytics, model future challenges and opportunities, ensure that insights are visual and actionable and construct technical capability that can scale to long-term plans.

17 Internet of Things refers the network of physical objects connected through software, sensors and network connection that enables these objects to exchange and collect data

Figure 2. Insight-driven organization



Source: *From Insight to Action*, Deloitte UK

Opportunities that data-driven insights can bring to the water industry

Many water utilities are starting to explore how to make data and analytics part of their decision-making process.

Early adopters of such approaches in the water sector have seen improvement in the efficiency of their operations, asset maintenance programs, and planning. For example, better capabilities to gain insight on the root cause of leaks or pollution and remediate issues more quickly, has helped reduce the impact of disruption for both the utility and its customers. Regular analysis of asset status and connectivity data have enabled the water utility to identify parts of the network that may be under stress, and predict early failures. Scheduling maintenance early to prevent such failures has in turn reduced the cost of emergency interventions. In business planning, many utilities now use analytical tools that analyze and monitor the economic effectiveness and efficiency of existing and planned maintenance projects.

However, there are plenty of other applications of advanced data analytics tools too. Enhancing demand prediction capabilities can have a great impact on the quality of water infrastructure and investment planning. Although utilities are already using their own existing data to model future demand, more organizations are enhancing these models by incorporating increasing volumes and a variety of external forecast data. These external data sets, for example, include demography, urban/municipal planning, weather patterns, soil moisture and climate change data. Enhanced models help utilities better understand where and when infrastructure may be needed in the future and how to time, prioritize, and focus their investment decisions. Such models also help utilities better simulate future risk scenarios and improve intervention response.

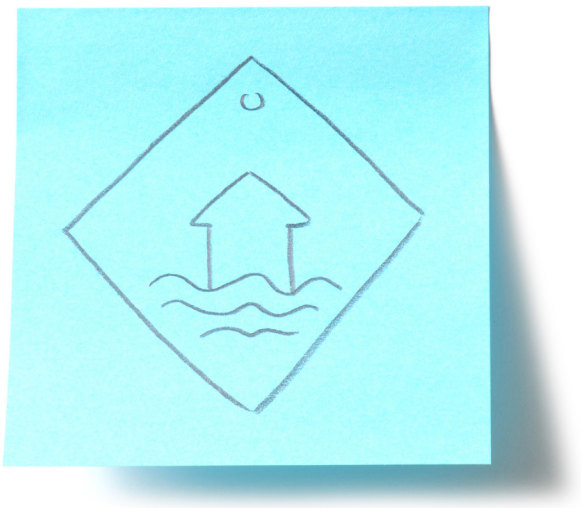
Better monitoring and analyzing anomalies in water meter data can also improve utility cash flows. Utilities will be able to understand why water delivered was not billed for. Spotting technical issues early that reduce water reading accuracy (often due to broken, blocked or old water meters) will help the utility recover revenue more quickly. Better data analysis can spot not only missed payments of water bills, but also detect reducing/increasing bill patterns or erratic customer payment behaviors. It can also identify high-risk customers and enable utilities to proactively engage with them.

Consumer business has been at the forefront of using data analytics tools to improve customer service for years. Retailers have been using consumer insight gained from a variety of data sources for focused and well-informed conversations with their customers about their issues, to anticipate their needs and to tailor services to them. Similarly, water utilities can enhance the quality of customer care with the help of data-driven insight. For example, detailed insight about peer-to-peer consumption levels and a customer's usage history can help spot instances of water misuse or leakage and enable the utility to contact the customer proactively. By analyzing customers in peer-groups, the utility may identify customers who are out of the norm and engage with them individually to help them reduce consumption. These data-driven insights therefore can help to build trust with the customer and enhance brand reputation.

As more utilities use data analytics techniques, more applications will be explored and more opportunities will emerge for their use.

Bottom line
The water sector is only starting to discover the potential that data-driven insights can offer. The road ahead is long, but the opportunity huge: data-driven business intelligence has the potential to radically transform the way water and water infrastructure is understood, managed and used.

Data analytics is more than just collecting, managing and analyzing data. It is really about improving the quality and speed of decision-making throughout the organization.



3. The power of the customer

Since *Water Tight 2012*, there has been an increasing trend towards focusing on the customer. Although the industry's profile is generally considered slow-paced and traditionally focused on building and maintaining physical assets, the sector is undeniably starting to respond to multiple disruptive forces and embrace innovative approaches in this area. Water companies are now beginning to explore what putting the customer at the center means for them and what the opportunities and challenges could be. Clearly, this will be a long journey that requires a shift in culture, business models and capital allocation, and has far-reaching implications for operations and talent.

This chapter explores what drives water utilities to focus on the customer. It covers trends that could have an impact on the way utilities and their customers interact and describes what a consumer's journey through a burst water pipe accident could look like in the future.

Disruptive forces driving consumer focus

Although industry trends vary by country, we see three potential forces that are driving this shift in focus towards the customer:

- new regulatory standards and incentives to lift customer satisfaction and the quality of customer service up to the same level of importance as operational efficiency and the effectiveness of capital programs;
- technological advancement in other, more customer-oriented, sectors driving customer power and growing customer expectations; and
- opening up the water market to competition in some countries.

While these factors create uncertainties and challenges for the industry, they also bring an industry-wide focus and new opportunities to the sector. Advancement in technology not only gives the water sector the tools to enhance the quality of customer experience, but learnings from other industries can make it easier to do it more cost-effectively and efficiently.

What could the future look like?

If current market trends are here to stay, and water companies continue to successfully adopt emerging customer management technologies, customer experience in the water industry can be fundamentally changed and improved. The following trends could shape the way utilities and their customers interact.

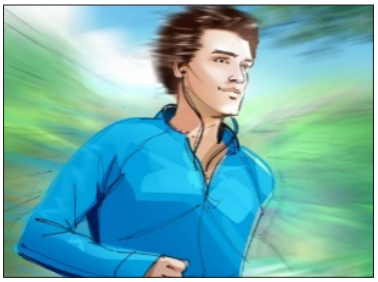
- In England and Wales, following the introduction of competition for non-household customers, water retail may become a fully competitive, customer-oriented industry. The introduction of competition in the non-household sector and the separation of retail from wholesale business is expected to lead to a resilient, sustainable and eventually competitive domestic water market. Based on similar experiences in the telecommunications and energy utility sectors, this gives traditional customer-oriented retailers an opportunity to enter the market and offer multi-product bundles, including water services.
- Smart water management can become an integral part of the connected home. The roll-out of energy smart meters could lead to the adoption of water smart meters. Therefore, both energy and water smart meters could become part of the connected home concept, in which a single technology platform allows customers to manage devices and appliances in their homes, and to purchase and consume services. Buying utility services, managing water, gas and electricity consumption, as well as selling micro-generated energy, could become typical features of the connected home in the future.
- If a fully competitive market becomes a reality, consumers may be able to switch between suppliers dynamically. Increased customer connectivity and availability of real-time consumption data through the Internet of Things or the connected home concept could drive competition in the water sector. This could allow the consumer to switch to the preferred supplier without any effort, perhaps even on a daily basis or several times a day. Data collected about the consumer could also help water utilities generate new offers and services and communicate them dynamically to customers.

- Customer contact is likely to shift to most interactions being outbound and non-voice. On the one hand, developments in customer contact technologies drive the shift from mostly inbound (i.e. customers contacting the company) to mostly outbound (i.e. the company contacting the customers) interactions between the water company and its customers. This is beneficial to both the customer and the utility as it can reduce the cost of contact and the effort for the customer. Further, integration of customer systems providing a full 360^{0} view of the customer, data analytics, decisioning engines and multi-channel customer contact technologies, can help decide whether there is a need to contact the customer and make the contact in a personalized way. On the other hand, automated service interactions drive the shift to non-voice interactions (i.e. not involving a conversation with an agent). This trend is relatively advanced in a number of countries worldwide: today most of the proactive service interactions, such as network issue notifications and bill payment reminders, are already automated. Only a small proportion of highly technical conversations require human involvement.

- Field service is becoming fully mobile and an integrated part of the customer experience. Field service in the water industry typically includes network maintenance, repairs, connections and meter installations. In the future, customer experience in field service could be fully integrated with the overall customer contact experience and delivered in a personalized way. This will be enabled by mobile customer and asset data access for field operatives, dynamic scheduling technologies and proactive customer communication. Dynamic scheduling helps optimize a field engineer's schedule, where an automated engine searches for the closest engineer with the right skill-set for a job and automatically allocates the job to the engineer. Technologies such as these ensure that the engineer's time is used efficiently and that service level targets are met.

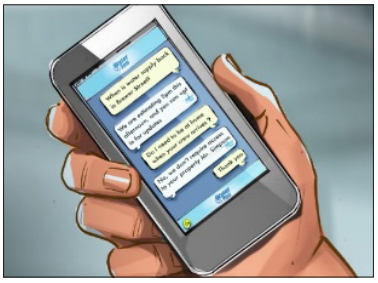
If current market trends are here to stay, and water companies continue to successfully adopt emerging customer management technologies, customer experience in the water industry can be fundamentally changed and improved.

The following scenario illustrates what a water consumer journey could look like from both the perspectives of the customer and the water utility in the future.



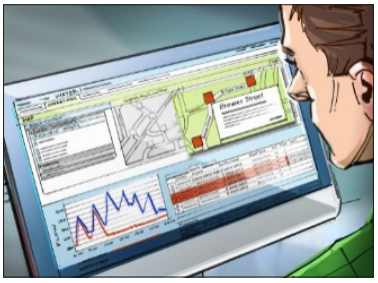
1. Chris is a young professional who lives alone in central London. He has an active professional and social life, spending most of his time away from home. Because of his busy lifestyle, Chris wants as little disruption to his daily life as possible.

2. Chris wakes up in his London flat and picks up his smartphone to check text messages. There is a message and twitter broadcast from the water utility informing him about a burst in his street. The water utility apologises as the water is likely to be off for a couple of hours.



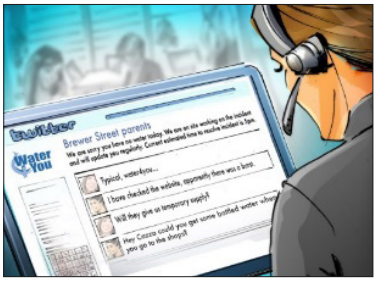
3. A crew is out to help, and Chris can use the water utility's app to receive status update notifications. Chris opts in. He has an important meeting in the office, so he uses live chat to ask if he needs to be at home when the crew arrives. He immediately receives a confirmation that he is not required to be at home.

4. Water Ltd. has already started proactive maintenance works in this area of the city following the analysis by the predictive maintenance system indicating a likely increase in incidents due to the old age of the pipework and increased population density. However, Chris's street has not yet been covered by the maintenance works.

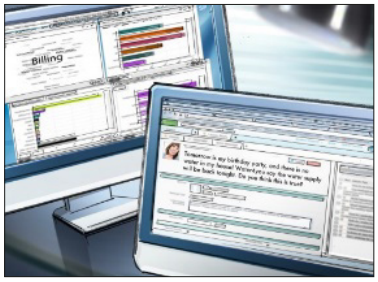


5. Smart meters from this street stopped sending consumption data, and a work planning and scheduling system created a suspected incident. A job was created for a technician to inspect the site, and Mike the field technician was identified by the remote navigation tracking system as the closest available resource. He receives the job on his tablet.

6. Before Mike arrives on site, he receives the water mains maps and the details of the known affected customers on his tablet. Mike inspects the site and confirms the problem to be a burst. He uses his app to call for additional technicians and specialist equipment to dig the road. The control room is alerted that a temporary supply may be required.



7. The work planning and scheduling system sends an alert to the customer service team as more customers may be affected. The potentially affected customers are identified, and broadcast twitter and text messages are sent. Marketing suppresses the planned campaign on service promise reassurance and launches a campaign apologizing to the affected customers for the service interruption.



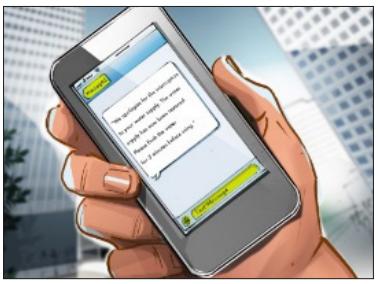
8. At the same time, the water utility's social media listening system identifies a negative trend in the geographic area around Chris's street. The customer service agents create a rule to capture the issue, and can start responding immediately and directly via social media.

9. The water utility's employees from across operations, customer contact and marketing can discuss the issue internally using tools like Chatter.

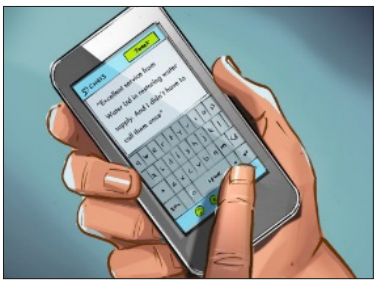
10. Andrea, whose elderly mother lives alone in a flat on the affected street, receives a text message: "There is no water supply at Mrs. Clark's property this morning. You may wish to check everything is ok."

11. New knowledge items / FAQs and social media content can be created quickly or existing FAQs highlighted. Customers on Chris's street are flagged in the system, so if they call the call centre they can be treated as a priority.

12. A notification is sent to the Customer Relationship Management system and a broadcast customer update is created confirming the burst and estimating the time to fix the problem. Chris receives an update with revised timings. He is glad to know that water supply is likely to be restored by the time he is back from work.



13. As Chris is travelling from work, he receives a text message apologizing for the interruption, confirming the water supply has been restored and advising him to flush water for a few minutes before using it. The message confirms that a flushing allowance has been applied to the next bill.



14. Next day Chris receives a text message from Water Ltd. to ask if everything is okay with his water supply. Chris replies 'yes', and tweets "Excellent service from Water Ltd in restoring water supply. And I didn't have to call them once."

Source: *Future customer experience in utilities*, Deloitte UK

Bottom line

The speed by which a water utility's engagement with its consumers develops and the shape it takes will largely depend on three factors: the support of other industries; the capabilities of the water companies; and consumer behaviors.

The telecommunications and infrastructure industries, and their wider supporting and consulting networks, will be crucial for the water sector's success in improving consumer engagement. The availability of assets (wider infrastructure and technologies) and capabilities (such as network management) at competitive prices will have a major impact on the water sector's future.

Water companies need to grow the following:

- Advanced customer data analytics require business capability and innovative technology tools to interpret vast amounts of consumption data. These in turn can support a new approach to product development and marketing strategies.
- New business and technology capabilities to enable proactive and multi-channel customer service would help build a 360^0 view of the customer and support data-driven decision-making. Water companies will also need to fully integrate social media monitoring (sentiment analysis) and social media communications channels within the customer service operating model.
- Customer retention and customer acquisition capabilities.
- Fully mobile field service capability will be required and needs to be integrated with the rest of the customer service operating model to support field interactions that are often the most visible part of the utilities' customer experience.

Finally, the most important enablers of the future water customer experience are the consumers themselves. They need to adopt the smart appliances and gadgets, and switch to digital communication channels to make this a reality.

4. The need for operational efficiency

Operational efficiency has become a buzz word in recent years, and a term that is used often, but what does it really mean? For some people operational efficiency is purely about cost reduction; for others it is about aiding growth, but doing so in a sustainable way; and for yet others it is about maintaining the status quo in an environment of increasing costs and reducing margins. None of these descriptions about operational efficiency are wrong, but in the modern day context of the water industry it is a combination of partly the first and mainly the last that has driven this agenda.

So why is this? The first thing that springs to mind is the large amount of public and private money that has been heavily invested into infrastructure to improve coverage and reliability of water supply and sewerage services in the past few decades. It goes without saying that this investment needs to continue in the future to meet both the growing demand we are placing upon our natural resources, and to upgrade and replace our ever aging infrastructure.

Secondly, utilities across the world have seen the cost of capital and provision of services escalate with limited ability to pass this cost on to their customers. Due to regulatory requirements that [rightfully] stipulate access to water is a human right, in the main, recuperating any of these costs becomes impossible. If the complexity and additional pressure some water companies are facing in the UK and Australia to demonstrate additional commitment to their customers are added to this, the landscape looks rather bleak.

Utilities ultimately have to do more with less to be able to continue investing in providing the same services and to meet new – regulatory and otherwise – challenges. This means reducing costs, using resources more efficiently and finding innovative tools and capabilities to achieve their targets.

Why is there a need for improved operational efficiency?

Water and sewerage utilities provide an essential public service whose primary focus is to provide drinkable water and to remove, treat and recycle wastewater. Whilst this doesn't sound like much, the provision of these services comes at a cost – and whether this cost is down to energy, treatment chemicals or human capital, they often represent a sizable portion of any potential profit. To date the reduction of this cost base has been seen as unavoidable by many in the industry, not helped by the fact that recently many costs have increased.

All this being said, a logical response would be to pass these cost increases to their customers, just as many private sector organizations in other industries do. However, the power is not always in the hands of the utility in this regard. Many regulators, such as the Water Services Regulation Authority (Ofwat) in England and Wales, restrict the prices that water and sewerage companies can charge their customers. In addition, the industry is also lagging behind when it comes to customer service. Whilst some parts of the private sector have for years placed the customer at the heart of their operation and tailored everything they do to those who purchase or utilize their products, the water industry is only recently turning its head to this way of thinking. Unsurprisingly, this is both operationally complex and expensive to achieve. It has necessitated a shift in how these companies are approaching their operations and investments, and also emphasizes the need for a mind-set aligned to the goals and objectives that operational efficiency can bring.

Proof of this can be seen in Australia where asset management and operational efficiency have become top areas for regulatory reform, reflecting the "growing concerns about the need to control costs and demonstrate value for money, both within the sector itself and for customers".[18]

To be able to maintain the provision of services and to meet changing regulatory requirements in an environment where increasing the price customers pay is a limited option, using a combination of old and new methods to reduce costs and make their operations more efficient is proving successful.

18 https://www2.deloitte.com/content/dam/Deloitte/au/Documents/energy-resources/deloitte-au-er-state-water-sector-2015-executive-summary-2.PDF

How can operational efficiency be improved in the water sector?

Water companies in many parts of the world are now following in the footsteps of other industries to improve operational efficiency. While the steps they take are broadly similar to other sectors, deploying advancement of data-derived insights can help them achieve their operational efficiency targets more quickly or easily. This is ever more the case when utilized simultaneously with the analysis, design and roll-out of a new business operating model, something that can be done at a number of different levels of the organization to varying degrees of intensity as the below examples illustrate.

- Going the whole hog: some companies will review their business processes on a macro, organizational level to ensure the optimal use of business assets. This involves understanding an entire business end-to-end from the customers served and the services provided to them, through to the associated delivery processes and the technology that supports them. For example, a number of water companies across England and Wales decided to outsource or use shared service centers for IT services, parts of operations, maintenance or customer contact centers.

- One small step at a time: other organizations only focus on improving processes on a micro, operational level. For decision-making to be effective on this level, we have found companies typically rely on insight generated from their own data sets to make more informed decisions. For example, some companies analyze chemicals demand data for treatment plants and integrate this more efficiently with their supply chain, to ensure they purchase the minimal amount of chemical required at the right time and at the most optimal price.

- Data and data analytics: some are using more sophisticated modelling capabilities. For example, modelling spot and future energy purchase costs has enabled a number of utilities across England and Wales to reduce associated costs without any impact on operations. Others have adopted workforce analytics to predict requirements for reactive workforce requests to ensure that human capital is used as effectively as possible by having the right people in the right place at the right time.

- Driving forward through digital: many more utilities are turning to digital strategies in customer service to support self-service and multi-channel engagement. This helps companies reduce costs while optimizing deployment of customer care staff where they can have the most impact and improve the quality of customer interactions. Digital also helps create a more efficient workforce through the provision of connected devices. For example, being able to provide maintenance staff with real time information and updates on jobs instantly improves first time fix rates and customer satisfaction through the improvement of better information flows.

Bottom line

It is rather challenging to try and conclude what is a varied and interesting debate about how best to generate operational efficiencies in the utilities, and specifically water, sector. From the wide variety of work Deloitte does with water companies, we have identified a need for companies to develop a more forward-looking strategy that considers both the evolving regulatory environment and the cost pressures and risks it can generate. Layered onto this is the increasing focus on the customer, witnessed in most industries and countries today, the consequences of which this industry is only just trying to understand.

At present, in England and Wales water utilities are also having to change their investment appraisal strategies to consider the whole life costs of a project, as opposed to just assessing their capital investments. This has placed even more emphasis on prioritizing investment decisions and understanding of how expenditure could be optimized through the use of a number of techniques, including operating models. The data and management information made available to guide and develop insight will be crucial to the success of any program of this nature.

It goes without saying that this forward-looking approach will undoubtedly require a cultural change that encompasses people, process and technology to achieve the financial and operational goals that will have been set. However, this is not an insurmountable challenge, but one that should be grasped head on – the potential rewards are great.

Utilities ultimately have to do more with less to be able to continue investing in providing the same services and to meet new – regulatory and otherwise – challenges.

5. The potential of technology

Water Tight 2012 commented on the key role that technology was expected to play in the future of the water sector. Our publication highlighted the importance of desalination in increasing water supplies, along with the impact smart meters and precision agriculture would have on managing and reducing water demand.

Since 2012, the balance of demand and supply has not improved. According to the Water Resources Group, the gap between demand and supply could be as much as 40 percent by 2030 assuming business as usual practices.[19] Therefore, technology's role in reducing this impending gap is becoming even more important.

In terms of water technology trends, there is a clear shift to making existing technologies, such as the notoriously energy-intensive seawater desalination, cheaper and more efficient. There is also more interest in advanced wastewater reuse technologies and techniques.

Therefore, this chapter focuses on recent developments in water treatment and wastewater technologies.

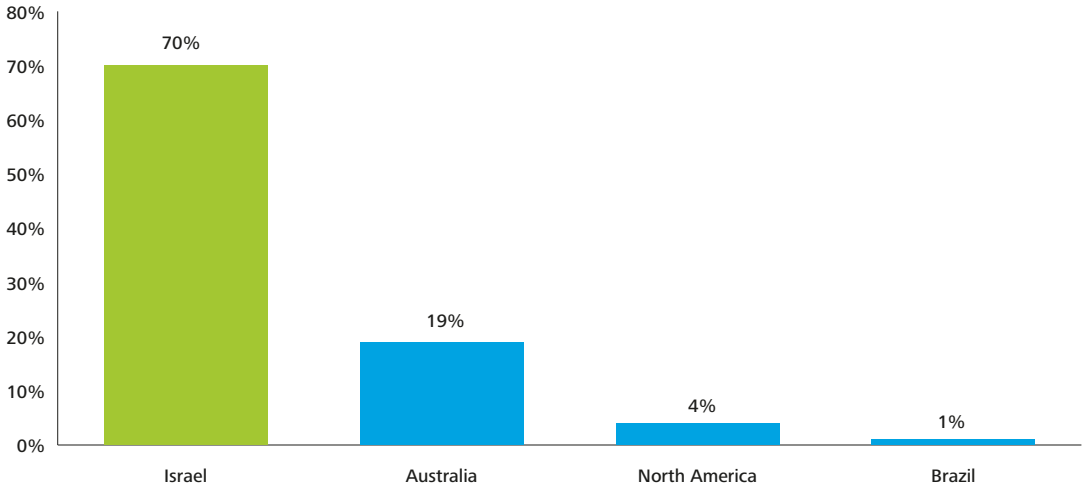
Difference between water treatment and water reuse

While water treatment simply returns much of the treated wastewater, or effluent, to groundwater or aquifers, water reuse takes the process one step further. It takes effluent from industrial and municipal sources and treats it to a level of purification that enables reuse in agriculture, industry and even as a potable drinking source.

Globally, countries with chronically inadequate water supplies, such as Israel and the Gulf States, have been the world's leaders in terms of water reuse per inhabitant. For example, Israel reuses 70 percent.[20] Water treatment and reuse efforts are now spreading around the world. For example, the Government of Western Australia, a "dry state in a dry continent," whose main industry is water-intensive mining, has committed to achieving 30 percent wastewater recycling in key cities by 2030 and 60 percent by 2060.[21] In the US, California has begun investing in reusing water up to drinkable quality.[22]

In line with the pressing need to increase water resources, the industrial water treatment and recycling market is set to grow by over 50 percent over the next five years, from around US$7 billion in 2015 to almost US$11 billion in 2020.[23]

Figure 3. Percentage of treated wastewater reused (2015)



Source: Ralph Exton, *Closing The Gap Between Treating Wastewater and Reusing It*, published by GE Reports, June 2015[24]

19 http://www3.weforum.org/docs/WEF/WRG_Background_Impact_and_Way_Forward.pdf

20 http://www.gereports.com/post/120556373453/closing-the-gap-between-treating-wastewater-and-reusing/

21 http://www.2030wrg.org/wp-content/uploads/2014/08/Good-Practices-Catalogue.pdf

22 http://www.sacbee.com/news/local/article2595660.html

23 http://www.wateronline.com/doc/rapid-growth-hits-industrial-water-treatment-technologies-0001

24 http://www.gereports.com/post/120556373453/closing-the-gap-between-treating-wastewater-and-reusing/

Increasing efficiency and lower cost: The membranes are coming

One of the most significant improvements the water industry has seen in recent years is the advancement in membrane technologies.

There is already a vast array of novel membrane materials used to treat and help reuse water. For example, polymeric and ceramic membranes are well known in the industry. The use of micro, ultra, nanofiltration, treatment by reverse and forward osmosis and electrodialysis technologies among municipalities, utilities and various industries is also spreading. Other membrane technologies, such as membrane bioreactors that combine biological degradation process with micro and nanofiltration, are seeing strong growth worldwide, particularly in large-scale applications.

The use of membrane technologies is increasing because of improvements in recent years that has made them considerably more affordable, efficient and effective. Most membrane technologies are now accessible to municipalities and water utilities along with companies in the oil and gas, mining and consumer business sectors. These industries use fresh and saline water in most stages of a project's life cycle so they can use significant volumes. As a result of such improvements, many companies in these sectors have managed to dramatically reduce their raw water intake.

Current research is focusing on improving membrane performance to make membranes last longer and resist degradation during cleaning. This would allow more water to flow through the membrane and less time to be spent on maintenance, thus increasing its efficiency.[25] Continuous improvements in membrane performance will allow their increased application in sectors where their use has been challenging in the past (such as the textile industry).

Bright future for other water treatment technologies

Some technologies, such as various forms of flotation and thermal technologies, have been considered too costly and energy intensive to be used on a wider scale in the past. There has also been a preference to limit the use of water treatment technologies that involve the application of chemicals, some of which can be prohibitively expensive.

Currently, research focuses on improving energy efficiency and reducing the use of chemicals and waste of these technologies. For example, in the oil and gas sector, hydraulic fracturing is a process to drill and inject a mixture of water, sand and chemicals into the ground at high pressure to fracture shale rock to release natural gas inside. This requires significant volumes of water. Companies must adhere to strict environmental standards on collecting, treating and disposing flowback from the wells, which can significantly raise the cost of shale gas production. However, new technologies are emerging that help reduce the amount of chemicals that companies pump down the wells or use to separate shale gas or oil from water. These innovative technologies include combinations of ozone, hydrodynamic cavitation, electro-chemical oxidation and hydrocyclon techonolgies, etc. Chemicals can be both costly to purchase and to remove from the sludge. Using advanced technologies that require less chemicals can lead to more water being injected back into the well, lower well injection pressures and simpler operations. Ultimately, these mean lower costs of water per barrel of oil produced.

Although water treatment and reuse technologies are getting more sophisticated, cheaper, efficient and effective, its by-product, sludge, still causes an issue. Treating and disposing of often toxic sludge creates both an economic and environmental problem. However, innovative technologies are opening up new opportunities in the use, treatment and reduction of sludge.

The value of sludge

Sludge, the organic waste in the water, is attracting more interest both within and outside of the water industry.

An increasing number of water utilities are investing in plants that capture the methane gas formed during sludge decomposition and using it as a source of renewable energy to lower the energy costs of water treatment.

In addition, valuable minerals and metals can also be extracted from the wastewater. Sludge produced yearly by a city with a million people can contain as much as US$13 million worth of metals, including gold and silver.[26] Other by-products from sludge, such as phosphorus and nitrogen, can be sold as fertilizer or used in the paper industry. For example, an Israeli company mines pre-sludge solids, sterilizes them and transforms them into a cellulose-based product useable in the paper, construction, plastic and energy industries. The technology also reduces wastewater treatment plant costs by up to 30 percent due to the reduction in sludge.[27]

25 https://www.umass.edu/newsoffice/article/improving-membrane-technology-water

26 http://news.sciencemag.org/environment/2015/01/sewage-sludge-could-contain-millions-dollars-worth-gold

27 http://www.jpost.com/Enviro-Tech/Israeli-company-mines-sewage-into-gold-330801

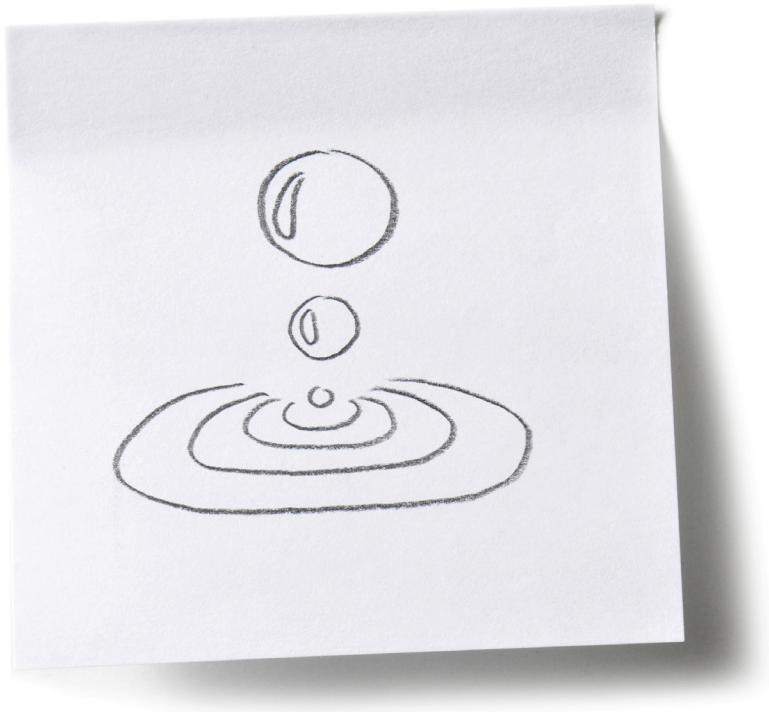
Treating wastewater without reusing it offers growing opportunities as technological advances continue to open up new sources of value in the wastewater process. Both the growth of this market and the pressures of climate change and population growth will likely continue to drive the industry forward from treatment to reuse.

Bottom line:
Forces that drive countries to invest in wastewater treatment are also pushing them one step further to invest in and utilize wastewater reuse/recycling.

Technological advances in recent years have improved the wastewater reuse process to make it cost effective, improve the purification quality and derive further value from wastewater.

The growth forecasts for the industrial wastewater reuse market, combined with the remaining gaps between treatment and reuse in large developed countries, suggest a substantial market opportunity in coming years.

In terms of water technology trends, there is a clear shift to making existing technologies, such as the notoriously energy-intensive seawater desalination, cheaper and more efficient.



6. The future of regulation

The primary purpose of water regulation is to set water quality, environmental and technical standards for providing water for household, public and industrial use, as well as effluent standards for wastewater. In most countries worldwide this is the responsibility of government departments or agencies acting on behalf of governments. With more awareness about the impact of climate change and pollution on hydrological cycles, a number of countries may look to tighten standards on the provision of water and sewerage services.

Deloitte believes that in an increasing number of countries, regulatory frameworks could also include more measures that require or incentivize efficiency savings, improvement in infrastructure resilience, governance and sustainability of operations in the future. In a number of countries with privatized water and sewerage industries, companies are required by the regulator to focus on the customer. Future regulatory frameworks could, and should, encourage technological and other innovations for demand management and supply provision.

This chapter provides a view on the future for regulation from England and Wales, where the introduction of retail competition may require the regulatory landscape to evolve to ease the transition.

Liberalized market and economic regulation

The water sector provides a range of vital services to businesses and households in England and Wales that support a way of life, public health and the environment. An efficient and well-functioning water sector makes an important contribution to the economy and supports economic growth.

Economic regulation has been used in the England and Wales water sector since it was privatized in 1989. The nature of water provision and wastewater collection means that natural monopolies exist (for example, in the water distribution and sewerage networks), which limit the ability to use markets and competition to deliver services for customers. Therefore, independent economic regulation provides a proxy for competition, protecting the interests of consumers to ensure that the service levels provided by water companies are reliable, of good quality and at an efficient level of cost.

Nevertheless, economic regulation remains second best to competitive markets in terms of delivering the right outcomes for consumers. This is in part driven by the information asymmetry between companies and the regulator. As such, economic regulators continue to look at ways in which they can promote effective competition and develop markets wherever possible.

Regulatory framework in England and Wales

In England and Wales, Ofwat has the duty to protect customers' interests while ensuring that the water companies finance and carry out their function properly. The regulatory framework applied by Ofwat caps prices that water companies can charge their customers every five years, promoting efficiency and fairness while still allowing companies to earn a return on their assets and investments. This framework has been successful in delivering:

- significant levels of investment in infrastructure, with over US$170 billion invested by water companies in England and Wales since privatization in 1989[28];
- efficiency improvements and reductions in operating cost; and
- improvements in water quality and the environment as a result of the introduction of higher standards and investments made by companies.

Two of the key components of the regulatory framework applied in England and Wales that have supported these outcomes are:

- the use of comparative analysis (yardstick competition) between the regional monopoly companies to assess the relative efficiency on operating costs and capital expenditure. The results are then applied to set efficiency targets as part of the price caps for each company over five year price control periods; and
- the use of a regulated capital value (RCV) approach, which is transparent and consistent, commits to a specific RCV value at the start of a period and then allows new capex to be added to the RCV, while decreasing it by a level of depreciation. This approach provides a commitment to remunerate investors, which in turn allows them to raise finance at competitive rates required for delivering substantial investment programs for long-lived assets.

28 Water UK, http://www.water.org.uk/policy/financing-industry

However, like the businesses it regulates, the regulatory framework applied by the economic regulator also needs to evolve and develop to meet future challenges.

An evolving framework

The latest price control review process undertaken by Ofwat (Price Review 2014 – PR14) represented the biggest change in the regulatory approach in the last 15 years, and included a number of key changes:

- separate price controls for different parts of the water businesses (wholesale water, wastewater, retail non-household and household);
- increased customer engagement with regards to what customers want and their willingness to pay, influencing the way companies develop their business plans;
- a cost assessment approach that focuses on total expenditure (i.e. the sum of opex and capex), removing a potential bias towards capital expenditure solutions; and
- a focus on the delivery of outcomes by companies, with specific incentives to reward/penalize companies if they out- or under-perform on specific outcomes.

These changes have further enhanced the existing regulatory framework to deliver outcomes that customers want. It has also been designed to support further development in the water sector, including the introduction of competition in the non-household retail sector in April 2017. The decision to use a totex cost assessment approach should also incentivize companies to use new technologies and innovate in providing services to customers.

Although the PR14 regulatory framework represented a significant change for companies, the water sector will continue to face a number of challenges in the future. Therefore, further changes to the framework are needed so that companies respond to and address these challenges.

Future challenges and how regulation needs to adapt

A number of the challenges faced by the water sector are also faced by other sectors. However, given the water supply and wastewater collection services provided by water companies, these challenges can have a significant impact on their ability to continue to provide these services in the future.

Climate change brings with it a number of challenges, with greater variability in weather. There is potential for extended periods of limited rainfall, heatwaves and droughts, together with other periods of heavy rainfall and potential floods. These types of events will put pressure on water companies, for example dry periods will impact water supply in areas where water resources are already scarce, whereas the risk of flooding will require changes to enhance resilience of assets used to provide services, such as pumping stations or drainage systems.

Increasingly stringent environmental quality standards will put pressure on companies to enhance and further develop their water and wastewater treatment processes. This is being brought about by the *EU Water Framework Directive* and the revised *EU Bathing Water Directive Environmental*.

Pollutants in water resources also pose a challenge to water companies. Tackling these at source can be a more cost-effective way of addressing this issue compared to installing additional equipment at wastewater treatment works.

The demands from customers, including population growth, will also challenge companies to continue to deliver services in the future. Population growth will continue to put a strain on companies in areas where there is already water scarcity. Customer expectations are increasing and they want to be informed by companies, in particular when things go wrong. Affordability and value for money of water services will continue to be an important consideration for many customers, and companies will need to work with their customers to understand how they value potential enhancements that might be needed to face future challenges.

How can regulation change to incentivize companies to meet these challenges?

Given the wide range of future challenges, there is a need to develop a regulatory framework that incentivizes companies to use new technologies and innovate to address these challenges. Regulation needs to provide companies with the right incentives and be sufficiently flexible to allow them to respond to future challenges.

A number of changes have already been introduced in legislation, through the *Water Act 2014*, to support a greater use of markets in England and Wales along the water sector value chain, in particular on upstream activities. Future regulation therefore needs to:

- identify and develop areas where markets (rather than regulation) can be used to provide the incentives for change and innovation;
- provide incentives over a longer period (not just the price control period), for example through building longer-term outcomes for companies;
- look to develop a more tailored approach to regulation to fit specific challenges that certain companies face, rather than having one size fits all framework; and
- support more integrated catchment management approaches to deliver lowest cost solutions to meet higher quality standards.

There are a number of key enablers that need to be developed in the short-term to facilitate this new type of regulation:

- information, both on efficient costs and on the value that customers place on certain outputs, which will support companies in making the right decisions over the long-term;
- collaboration, between various stakeholders to achieve higher quality at a lower cost; and
- trust between various parties in the sector – between customers and companies, between the regulator and companies, and between companies – to develop collaborative solutions.

Bottom line

Since privatization, the England and Wales regulatory framework has made incremental improvements to deal with specific issues one at a time. The challenges faced by the water sector today and in the future means that the regulatory framework will need to take a larger step than the one taken at PR14. This is most likely to lead to a different approach being applied to specific areas of the value chain in the sector. Investors will want to protect the value of investments made to date. The development of future regulation will need to take this into account, but this should not act as a barrier to further development of the future regulatory framework that addresses future challenges, delivers for customers and ensures that the water sector continues to make a significant contribution to the economy, society and the environment.

An efficient and well-functioning water sector makes an important contribution to the economy and supports economic growth.

7. New financing methods

The world needs more and more resilient water infrastructure. While developing nations need new assets, developed countries face issues with aging infrastructure and declining quality of water resources. According to the OECD, US$6.7 trillion needs to be invested in water supply and sanitation by 2050.[29] This number can triple by 2030 if a wider range of water infrastructure is included.

Historically, the sector relied on a handful of financing models, such as various forms of bonds, taxation, tariffs or government funding to build large-scale infrastructure, such as canals, treatment plants and pipes.

However, building new assets or simply replacing old ones may not be the best solution for the future. Communities are now having to deal with the impact of climate change, extreme weather patterns, population and economic growth, and aging water and wastewater systems. Many now believe that these challenges present the need for new water management strategies. Some of the solutions may not be large-scale conventional infrastructure, but include new practices, techniques and devices to conserve water and retain storm water, such as drought resistant landscaping or permeable parking lots. New water supply technologies and data analytics also offer opportunities to redesign water systems covering larger geographies and involving a larger number of factors and stakeholders.

As challenges grow more complex and wide-ranging, and new solutions arise, financing models must evolve to ensure that the US$trillions needed can be raised.

This chapter discusses new financing approaches to deal with specific issues that arise in England and Wales, but could be adapted and implemented in other countries too.

A view from England and Wales

England and Wales have well-developed, privately-owned water and wastewater infrastructure networks. These need to continue attracting investment to modernize and be able to respond to challenges associated with demographical and climate change. The sector is also facing regulatory challenges – some of these have already been discussed – that require utilities to become more customer-oriented. There is also a growing need for the sector to coordinate and collaborate with its main users, agriculture and industry, to jointly develop more efficient water resource management plans on a regional and national scale. Technology to make water treatment and reuse/recycling cheaper and efficient will also play an important part in increasing supplies and reduce the environmental impact of the industry.

All these factors will affect the investment case in the England and Wales water sector.

New market, new financial solutions

The regulated water sector in England and Wales has a strong track record of raising long-term finance on attractive terms compared to other corporate sectors. Water utilities have traditionally had access to long-dated bond markets to finance their operations and capital programs. The access is based on water company investment grade credit ratings that typically range from A3 to Baa1. Some utilities, however, may need to lower gearing to be able to maintain the credit ratings they need to support long-term financing.

The introduction of retail competition for non-household users in 2017 means that players who do not have access to the investment grade market will need to rely on other forms of financing, such as commercial lending (bank term loans and revolving facilities), asset-based lending, alternative lenders and structured equity.

Why the need for integrated planning….

While England and Wales water utilities have long-term water resources management plans, these are not integrated with the development plans of other industries, such as agriculture, manufacturing or power generation, which are also the largest users of water resources. However, there is an increasing need for a more holistic approach to water resource management that encompasses inputs from multiple sectors to bring efficiency, economies of scale and greater benefits to the environment.

29 http://www.oecd.org/environment/financing-infrastructure-for-a-water-secure-world.htm

An integrated water resources management plan would capture capacity, timing and operational strategy for new water infrastructure, in response to the different requirements of abstractors. From a financing perspective, integrated planning would bring multiple benefits including:

- potential for major user industries to invest in water supply assets depending on an appropriate regulatory approach. This could mean sharing the costs, risks and benefits of relevant portions of specific assets among multiple stakeholders. This could also increase resilience and meet future demand of specific users without significantly increasing water bills for other customers;
- more cost-effective financing, procurement and management of water infrastructure that serves multiple purposes;
- potential to utilize long maturity financing, which can be raised in the regulated England and Wales water sector for a relevant portion of multi-sector water supply assets; and
- adoption of innovative financing structures by water companies alongside traditional financing.

To successfully establish integrated plans in England and Wales, there may be a role for an industry-wide coordinating body with responsibility for promoting effective use of water resources across companies and regions. For example, a coordinating body may conclude that a reservoir should be completed to serve customers across several regions, whereas it is undoubtedly more difficult for one water company to make such a case. A coordinating body could therefore promote agreements between companies and propose funding structures via a regulatory process, whether through existing structures or following the example of the innovative structure adopted for the Thames Tideway project.

The coordinating body could also have responsibility for promoting effective water trade, various types of which already exist. These are based on legacy bulk supply agreements and are dependent on the availability of water from the supplying company.

…and how financing structures to support it may evolve

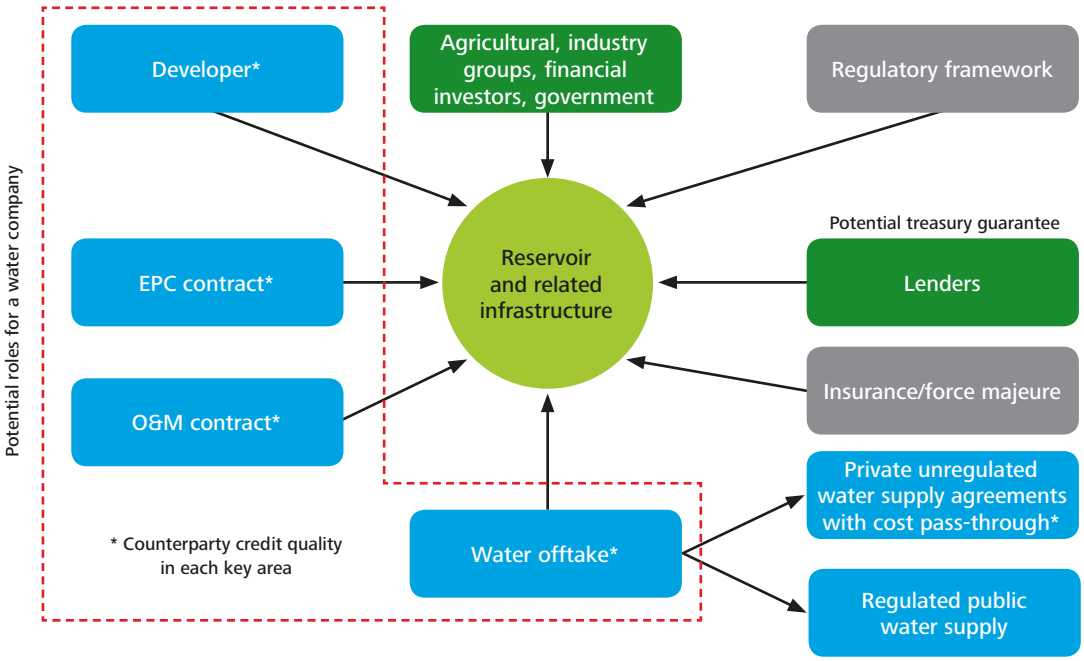
A range of innovative financing models, already used in other sectors, may be used for multi-sector investment in water supply infrastructure, depending on how the regulatory framework will evolve in the future. Examples of financing models, relevant for both new build and operational assets, may include:

- conventional financing through a long-term bond market on balance sheet of a water utility, supported by increases in regulatory capital value, which is potentially segregated for individual sectors in proportion to their future expected or committed use;
- project financing (with or without government debt guarantees);
- corporate (on balance sheet) financing and pooling of funds by water-intensive users (industrial and agricultural businesses), trading houses and retailers;
- public private partnership (PPP);
- off-take at cost in proportion to ownership;
- leveraged prepayment for future water supply; and
- cooperative structure with tradeable rights to water.

The water sector is also well-placed to test alternative financing options, such as pooling investments in an infrastructure fund by cross industry players and utilizing it to invest in selected projects.

As suggested in Figure 4, water utilities are likely to play multiple roles in financing water infrastructure, including acting as a developer in an engineering, procurement and construction (EPC), or EPC- management (M) contractor capacity, as an operations and management (O&M) contractor and water off-taker. The ability of the project to be financed will be dependent on counterparty credit quality for each key contract and role, so leveraging water utilities balance sheets as much as possible would be advantageous.

Figure 4. Illustrative commercial structure



Source: Deloitte UK

The objective of each financing structure is to align risks and costs of developing new water supply infrastructure with future benefits, such as reliability of supply, preferential access and dividends. This approach has the potential to enhance the affordability of water infrastructure, which does not belong fully in the regulated water sector. Consequently, projects that would otherwise not go ahead or be delayed can be implemented with economic and environmental benefits.

However, procurement and payment arrangements need to be transparent to satisfy Ofwat and consumers that regulated water revenues are being used appropriately and are not subsidizing large farming or corporate users. Improved metering, data capture and analytics can also support the appropriate allocation of costs and financing benefits.

Government roles

The current regulatory framework may not accommodate alternative financing structures which are widely used in other sectors such as telecommunications or power generation. Therefore, it needs to evolve before some of the financing structures could be implemented.

The government in England and Wales can play a number of roles in financing future water infrastructure. These could range from enabling investment through robust regulation and favorable legal and tax frameworks, to infrastructure debt guarantees and equity participation.

In some financing models, such as PPP, it could be the contracting authority, in others it may co-invest and share risks pari-passu with the private sector.

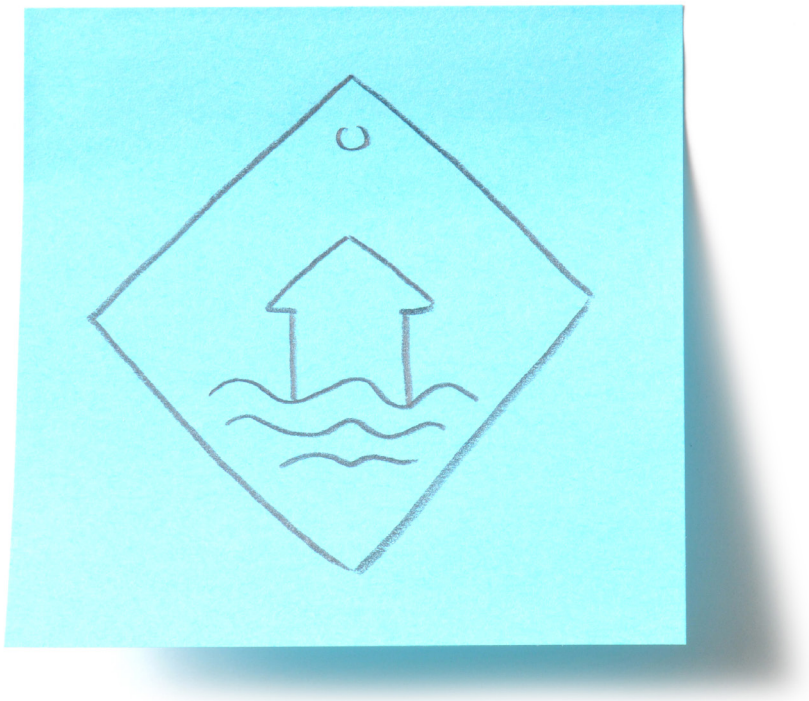
Bottom line

The England and Wales water sector could establish an integrated water resources management strategy involving its main stakeholders. This could help the industry develop the investment case for multi-sector financing.

Integrated planning that takes into account the water needs of all industry sectors at a regional scale and a multi-sector financing approach could potentially bring a number of benefits, such as economies of scale, more efficient water use, more reliable agricultural abstractions, better crop yields and better environmental protection.

With adequate support from the regulator, a range of financing structures could be used to finance investment in water infrastructure that enable fair allocation of the costs, risks and benefits among stakeholders. The structures may be appropriate for both the primary (greenfield development) and secondary (operating assets) market.

As challenges grow more complex and wide-ranging, and new solutions arise, financing models must evolve to ensure that the US$trillions needed can be raised.



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Designed and produced by The Creative Studio at Deloitte, London. J4550