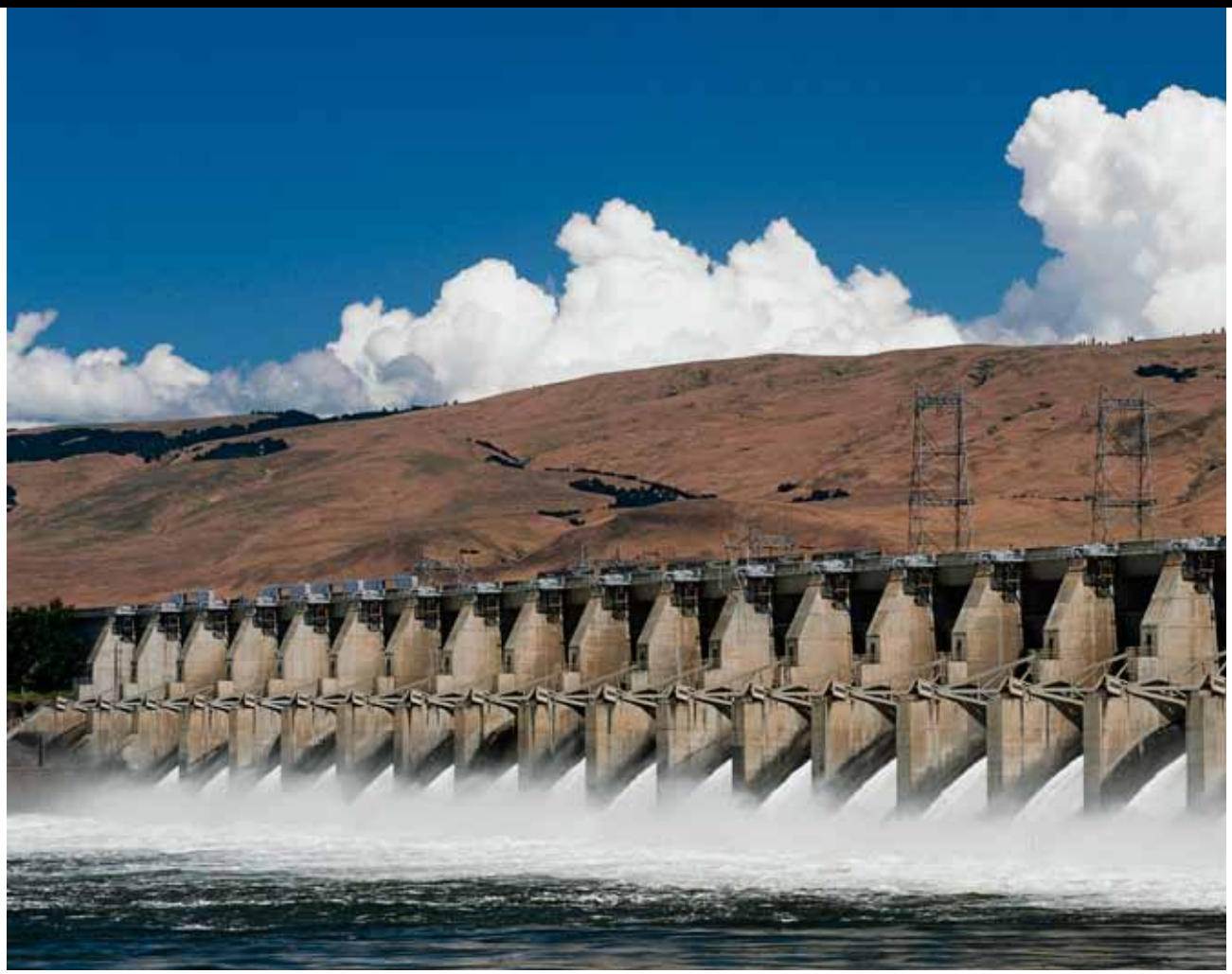
How sustainable is our water supply?



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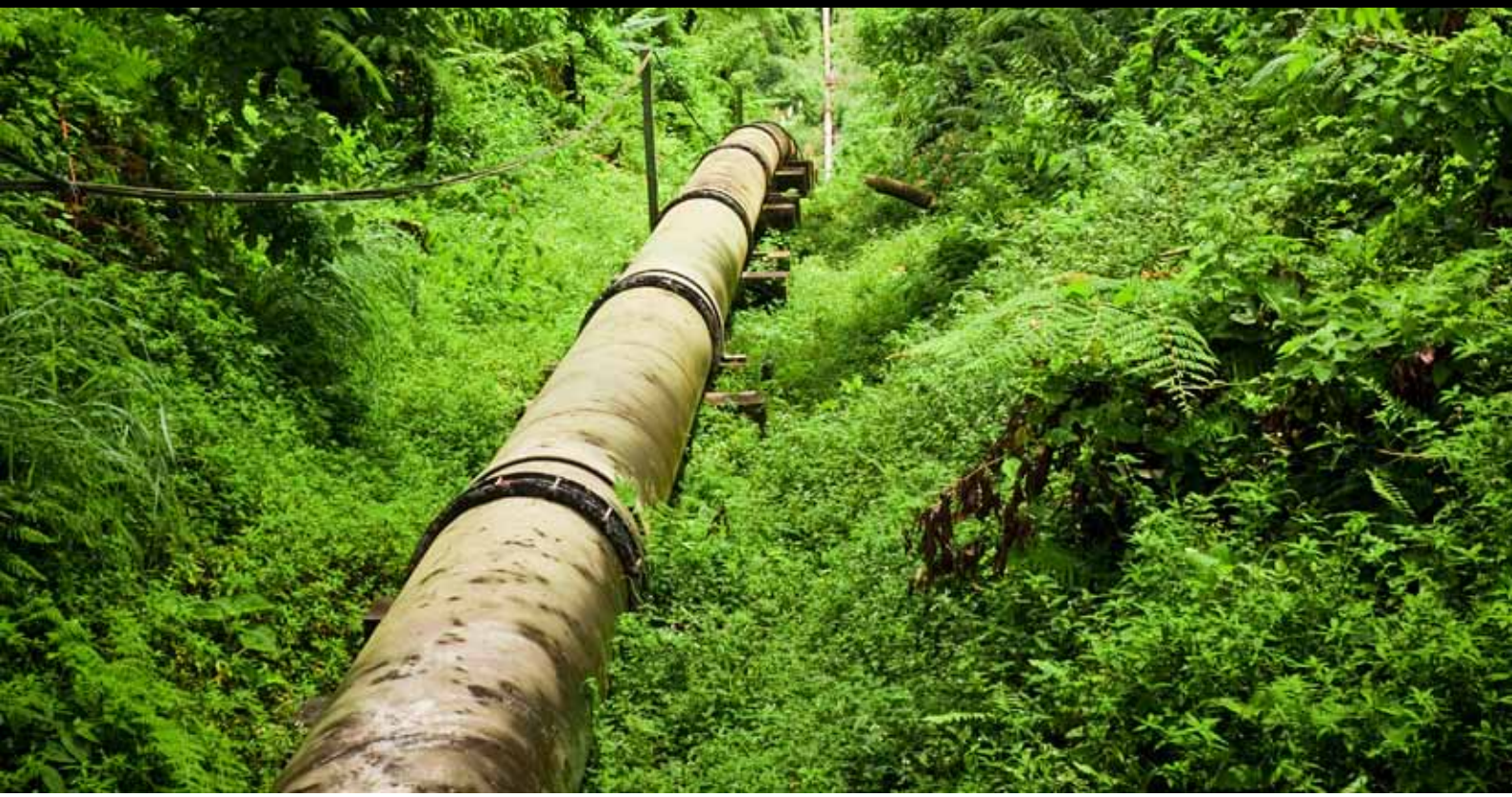

How sustainable is our water supply?

Predicted high population growth rates, issues of climate variability and regulatory reform are all expected to present many challenges for the Australian water industry over the next five years. While the water industry continues to function well, it also has a vital role to play in responding to these future challenges in the most sustainable way, enhancing overall performance and keeping costs down.

Some of the key challenges identified in the 2014 Australian Water Association (AWA) 'State of the Water Sector' (SWS) report included: improving operational efficiency; maintaining and augmenting infrastructure; water security and supply; and concerns over rising prices.

By embracing the latest advances in technologies, innovations and management techniques, it may be possible to achieve sustainable and efficient solutions for many of the challenges that face the water industry.

This eBook presents articles that include details on: the challenges for the water industry; how the water industry can contribute to liveable cities and urban water management; and how intelligent water technologies are driving efficiencies in water management.

Carolyn Jackson

Editor - *Sustainability Matters*

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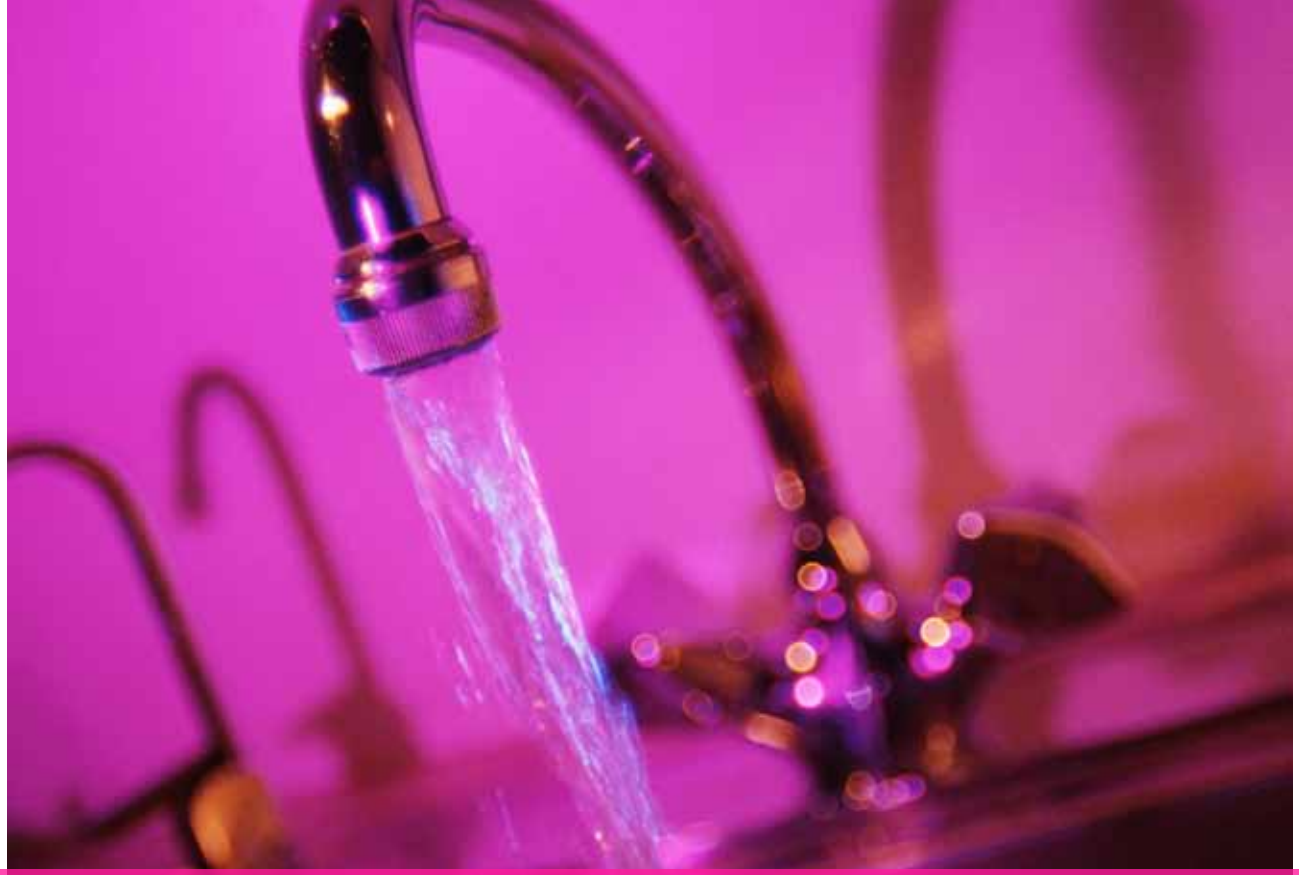

Challenges for the Australian water industry

Dannielle Furness

The Australian water industry is at a crossroads. While many industry members believe that current methodology around availability, management and supply is meeting the needs of our nation's requirement, the predicted growth demand over the next five years will present challenges.

The Australian Water Association (AWA), an independent not-for-profit, is the nation's leading association for water professionals and organisations. In April 2014, the AWA partnered with Deloitte and surveyed around 1200 water industry professionals on current and future industry issues. The results were published in October 2014 as the 'State of the Water Sector' (SWS) report. As the fourth consecutive study, survey responses are tracked over time, presenting a unique opportunity to devise adequate planning and preparation for the future from within the sector.

The industry is working well

Participants were asked to assess the current situation and to identify issues - both immediate and on a five-year projection. In terms of present performance, over 60% identified the industry as working well, with the effective treatment and disposal of sewage to ensure supply security as the most effectively handled activity.

Immediate issues

The biggest recognised need was operational efficiency improvement, which reflects a continued concern to control costs and demonstrate value for money. Additionally, maintaining and augmenting existing infrastructure, ensuring secure supplies and responding to community concerns over price were identified.

The future

Ensuring a sustainable supply is the greatest challenge. While current management levels are deemed adequate, concerns over ongoing supply indicate that the impact of increasing competing demands, climate change and projected population growth is recognised.

According to a report issued by IBISWorld Australia in January 2015, compound annual growth for the water industry between 2010 and 2015 is estimated to top out at 6.7%, totalling $11 billion in revenue, which incorporates a $3.7 billion profit. This is attributed to increased investment in the industry's asset base, resulting in fee hikes for consumers and business.

Projected growth for 2015-2020 is tipped at 3.4% and IBISWorld suggests that the next five years will be challenging due to expected ongoing erratic rainfall conditions. There is pressure to restrain capital spending, reform structures and reduce administration. IBISWorld predicts a 2019-20 annual turnover of $13 billion.

Reform and economic regulation

In 2004, states, territories and the federal government officially recognised the need to improve the coordination of water management, subsequent efficiency of water use and the health of our river and groundwater systems. All parties signed the National Water Initiative

(NWI), which involves a range of reforms including improved planning, trading and accounting.

According to the Australian Bureau of Statistics (ABS), "Water markets are an important mechanism for allocating water efficiently and contributing to NWI goals of managing water to optimise economic, social and environmental outcomes", and they estimate that the 2009-2010 value of transactions for traded water was almost $3 billion and involved 4444 gigalitres (GL) of water.

SWS participants nominated increased operational efficiency, investment in asset maintenance/augmentation and clarifying governance of the sector as the top three priorities for industry reform.

Ensuring supplies

Australia is entirely dependent on precipitation for water supply, which is made available from surface water in the form of rivers, lakes, reservoirs, dams and rainwater tanks, and underground aquifers including wells and bores. Connectivity between surface and groundwater sources is recognised and connected systems are managed as single resources under the NWI.

Dams

To maintain surface and groundwater source supply, man-made water storage is critical, so survey participants were asked to identify the efficacy of dams for managing water security. While around 84% of participants agreed dams are 'somewhat' effective and 55% supported more dam construction, backing for 'big dams' in specific regional areas was low.

Desalination

Although 96% of the respondents agree that desalinated water is suitable for treatment and management to a level sufficient for a safe and reliable potable supply, there are concerns around the sustainability and cost-effectiveness of this method. There has been heavy investment in desalination technology in the last 20 years. It is projected that the six major plants in Australia have the capacity to meet additional demands of our capital cities until 2026.

Recycled water

Water recycling is considered a sustainable source of non-potable water for municipal and industrial use and has attracted much investment over the last two decades. Its current suitability for provision of potable supply is lower, yet the feeling is that potential future water supply strategies should incorporate further investigation into recycling technologies and solutions.

Recycling and desalination are expensive methods for reducing our dependence on highly variable rainfall levels, but rural water sources are seen as another suitable option for transferring water to increase supply in urban areas.

Urban stormwater

Stormwater harvesting is growing, particularly in the areas of irrigation for parklands and agricultural areas. As with recycling, stormwater is seen as most advantageous for industrial and municipal use, with less support in terms of suitability for supply to cities.

Pricing

Both government and industry are concerned about public perception of water pricing, so a number of regional initiatives (such as rebate schemes and increased concessions) have been implemented to combat negative attitudes.

It is essential that any plant equipment upgrade program ensures that proposed technology is not only state of the art, but user friendly, efficient, commercially viable and capable of delivering high reliability.

While public perception is important, there are calls for increased pricing to reflect the relative scarcity of water as a resource and for implementation of a comprehensive 'user pays' system that will deliver full cost recovery.

Many believe a system of increased metering and adherence to volume-based pricing will provide incentive to reduce excess water usage. Implementation of variable pricing mechanisms, including scarcity pricing, which is introduced when dam levels are low, would cover the cost of turning on desalination plants, negate a costly overhaul of existing water systems and help avoid reintroduction of stringent water restrictions.

State of the nation

Although the industry appears to be taking a unified approach through implementation of the NWI, discrepancies between states and territories remain. Attitudes towards suitability of supply options are dependent on external influences, such as regional climatic conditions, as well as existing internal infrastructure.

What is not in contention, however, is the requirement to improve operational efficiencies all round. So what has to change?

Tools for change

Technology

Industry investment in assets and staff should be augmented by the use of technology and innovation to drive down costs.

In a time of budget cuts, it is essential that any plant equipment upgrade program ensures that proposed technology is not only state of the art, but user friendly, efficient, commercially viable and capable of delivering high reliability. In other words, the water industry is looking for 'bang for buck'.

The remote and isolated location of many asset installations demands a superior life cycle so expectations of performance are high, especially given the cost of maintenance and upkeep associated with distance travel.

Available technologies to address the difficulties associated with remote locations include hydrostatic level measurement in dams, bores and tanks, as well as multipoint and continuous level use in tanks, pits and storage vessels. The use of such technology can minimise instances of overflow and provide pumping equipment protection in the event of low water levels. Improving water treatment and supply processes tends to lower costs and improve overall performance.

Restructuring the utility model

Infrastructure Australia released the National Infrastructure Plan for 2013 and identified ways to improve water supply. Long-term planning in combination with flexibility will help sustain the in-

dustry. The extended drought from 2003-2012 resulted in water restrictions that severely impacted the industry. While most major cities invested heavily in water infrastructure to supplement supply (chiefly desalination plants), revenues were simultaneously on the decline due to demand management measures.

It seems a complex regulatory system is compromising the industry's ability to plan long term. In the face of climate change, the water industry must be supported by stable regulation and commercial returns on regulated or approved investments. Calls for a single regulatory body suggest that it would provide, short term for customers and investors, a more efficient regulation system with clear national objectives and improvements for competitive private sector investment.

Full cost recovery pricing will ensure that existing assets are maintained and that funds are available to deliver new infrastructure. The report suggests that strengthening partnerships between government and the private sector will build a more competitive and innovative professional water services market.

The National Water Commission (NWC) was established as an independent statutory authority to provide advice and to oversee the objectives and outcomes of the NWI. As of 1 January 2015, it ceased to exist, with core activities being passed on to various other bodies.

Infrastructure Australia claims that between $50 billion and $60 billion of publicly owned water assets are suitable for transfer to the private sector. They assert that two decades of significant governance reforms has created a more commercial industry encompassing changes to pricing regimes, property rights and water trading arrangements. The way has been paved for more private asset ownership.

The upshot

The message seems clear: the water sector would benefit from a more unified regulatory approach and increased privatisation, which in turn will encourage infrastructure investment.

Importantly, though, outlay to improve operational efficiency must deliver as promised if costs are to be contained and overall performance enhanced. Embracing the technology available today will not only deliver immediate benefit, but position industry members well to respond to future challenges.

How water contributes to liveable cities

by Adam Lovell

Many organisations are developing their position on liveability and how they contribute to liveable cities and areas. It's a worldwide conversation and the urban water industry plays a key part.

We know that water is a foundation for urban liveability. Without the provision of clean and safe drinking water and effective wastewater and stormwater services to protect the environment, our urban areas would not be the liveable, sustainable, resilient places we see today.

Of course it goes without saying that our customers expect us to continue fulfilling this role. But contributing to liveability is more than just providing the services.

Examples of how urban water organisations can enhance liveability are happening around Australia. One example is at Sydney Water, where four programs have been established to demonstrate its contribution to liveability. These include: People and places program; Land and waterways program; Growth and servicing program; and City futures program.

The programs are being supported with the utility's liveability themes of connect, collaborate and innovate. One example of the land and waterways program is the work at the Cup and Saucer Wetland. The project has seen Sydney Water partner with local council, other organisations and importantly the local community to replace deteriorated concrete riverbanks with sandstone and native plants and treat stormwater flowing from Cup and Saucer Creek. The collaborative work has improved aesthetics in the area and provided a habitat for wildlife, and includes seating and an outdoor classroom for local residents to enjoy.

At City West Water, its Greening the West Strategy has the community at its core. Reflecting the themes of liveability, the strategy has strong community input to deliver positive outcomes for residents and businesses in the area. By partnering with local councils and other authorities including Department of Health and VicRoads, the regional partnership aims to promote sustainable and healthy communities in Melbourne's west by increasing urban greening. The strategy recognises that water authorities can deliver more to the community by extending its core skills beyond just water supply and management.

Recent research conducted by Sydney Water shows that the water industry's involvement in these types of projects and programs is welcomed by the community. The outcomes of this work are being used to guide the business to do those things that contribute to liveability in ways that their customers value.

To ensure we continue to enhance the urban water industry's role in liveability we need to engage, partner and innovate. Engage with our customers and local communities. Partner with government, the private sector and community groups and innovate to achieve different and broader outcomes that contribute to liveability. By doing this we demonstrate that water is not just a foundation for liveability - it's part of enhancing and improving liveability for the future.

Urban liveability also depends on water, energy, waste and other services collaborating in planning, then delivering new projects and precincts.

Liveable communities may be viewed as more expensive but we don't know yet how communities value liveability. Liveability in Australia supports a productive and prosperous nation. It is a point of difference we can be proud of.

But challenges remain: we must ensure our customers and communities are engaged at the outset. Traditional engineering solutions don't always present value to the customer and taking a focus on customers and working across the sectors provides the best chance of continuing to support a productive, prosperous and 'liveable' Australia.

Everyone has a slightly different view of what liveability means for them, as does every government and organisation. The important thing is how we work together on key issues and opportunities that will demonstrate we all understand and want liveability to be real.

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Water management in cities of the future

by Professor Tony Wong

Recent occurrences in Australia of severe droughts, heat-wave conditions and floods highlight the vulnerability of future cities (and towns) to the chronic and acute effects of climatic extremes. Global population continues to rise and by mid-century, 70% of world population will live in cities. These emerging challenges manifest into such questions as: the capacity of a city's natural water resources to support a growing population; the vulnerability of these natural resources to climate change and urban pollution; the institutional and community capacity for transformative change to become more resilient; and ultimately, the question of the liveability of the city.

The long-term productivity, prosperity and liveability of cities and towns are fundamentally underpinned by the sustainability (carrying capacity) and resilience (coping capacity) of the city. The quality of living in these environments defines its liveability (comfort capacity). Each of these city attributes is interrelated and self-reinforcing but can also be at risk of being mutually competing when individual objectives are pursued without due consideration to broader dynamics of city development.

Concepts of water sensitive cities are emerging in city-shaping policies and responding to a general consensus that existing water services and planning processes are poorly equipped to support projected population growth and slow to respond to economic and/or climatic uncertainty. In essence, cities were trying to meet 21st-century challenges by reinvesting in 19th-century strategies and infrastructures. For example, it is increasingly difficult and inappropriate to adopt a traditional economic-risk management approach to infrastructure planning and development when planning for occurrences of events for which there may not be probabilistic profiles.

Our cities and towns have always been the platform of 'social-technical experiments' and the intersection of competing and complementary objectives. The words 'urban design' have never been more prominent in our water sensitive urban design journey. What is clear is that water sensitive urban design is the process and water sensitive cities are the outcome. A water sensitive city will be a collection of interconnected water sensitive precincts. In each one, site-specific plans will be developed to respond to local opportunities and constraints. These precincts will: efficiently use the diversity of water resources available; enhance and protect the health of urban and natural waterways; and mitigate against flood risk and damage. Public spaces are green infrastructure that harvest, clean and recycle water, increase biodiversity, support carbon sequestration and reduce urban heat island effects.

Realising the vision for a water sensitive city will require a major sociotechnical overhaul of conventional approaches to urban water management. It requires the transformation of urban water systems from a focus on water supply and wastewater disposal to more complex, flexible systems that: integrate various sources of water; operate through a combination of centralised and decentralised systems; deliver a wider range of services to communities (eg, ecosystem services, urban heat mitigation); and integrate into urban design.

A new or expanded economic valuation framework for assessing land and water projects will be required to account for the many benefits (externalities) associated with contemporary urban water management. This requires us to draw the connections between urban water management and urban liveability and to quantify their benefits. The framework will also identify the direct and indirect (community) beneficiaries and provide the basis for public/private investment in these projects.

Adaptive and integrated management approaches offer an alternative to the traditional urban water regime and present alternative urban water governance frameworks to support more sustainable and resilient practices. Sustainable urban water management regimes would emphasise a systems approach with interconnections between the management of the urban water streams and other related urban water governance functions such as land use planning, urban design, infrastructure delivery and maintenance, project financing etc. The ultimate objective is to deliver initiatives that underpin the sustainability, resilience and liveability of cities, the foundational attributes of cities of the future.

Cooperative Research Centre for Water Sensitive Cities
www.watersensitivecities.org.au

Professor Tony Wong is Chief Executive Officer of the Cooperative Research Centre for Water Sensitive Cities. He is internationally recognised for his research and practice in the sustainable urban water management, particularly in Water Sensitive Urban Design.

Intelligent water:
how unique technologies are driving efficiencies in water management

Derek Vogelsang, Business Technology Practice Leader, MWH Global

In a world of constrained water resources and extreme weather events that can often disrupt water supply, effective water management is paramount. The challenges of managing water supply and security have contributed to rising costs for customers in recent years.

Water utilities across the board are being challenged to reduce the costs of supply and to look at ways to deliver water more efficiently. Specific technologies developed for water utilities can enable infrastructure to be managed more efficiently and drive savings for the end user.

Pressures on water management

The cost of water for customers in Australia has risen on average by at least 15% in the past year alone. This, combined with rising living costs more generally, and the pressure to maintain positive customer sentiment and meet regulatory requirements, is placing significant pressure on utilities to reduce the cost of water.

Water companies are looking at ways to reduce operating costs so that savings can be passed on to customers. A large part of their focus is on operational efficiency across their networks.

Driving efficiencies is key

Developing more operationally efficient water networks will ensure economic benefits, as well as provide other advantages such as improved network reliability and a reduction in customers impacted by emergency incidents. This enhanced level of service can both meet and exceed ever-growing customer expectations.

In response to the situation faced by water utilities, MWH Global has been developing a technology solution to allow more efficient operation of water networks, helping water utilities to significantly reduce their operational expenditure.

The challenge for Adelaide

In 2010, SA Water engaged the Waterlink Joint venture which comprised MWH Global, Tonkin and Parsons Brinkerhoff to deliver the interconnection of the Adelaide water supply network. The outcome of this $403 million investment would improve flexibility and reliability of supply, improve water security during events such as prolonged drought and increase capacity to allow for demand from population growth until 2050.

SA Water required decision support tools to help the organisation make informed choices to get the best out of the new infrastructure and deliver for its customers.

MWH and its business intelligence service, which provides tools and software to drive efficiencies in operations and asset management, were required to design and develop a suite of sophisticated, decision-support tools, to enable the optimal operation of the Adelaide water supply network.

Unique technology solution

MWH has worked closely with SA Water to develop a suite of tools that can deliver valuable operational and predictive analytics, ensuring that both current and future maintenance and operations are taken into account.

A demand forecasting tool is capable of calculating demand (how much, where and when) across the entire network at 30-minute intervals, seven days a week. This means that at any point in time, SA Water can generate a demand profile across the network, allowing the organisation to carefully balance supply and demand at all times.

A distribution optimisation tool provides a clear picture of how this demand can best be met - by analysing how much water needs to be supplied to meet demand against the available water (in dams, pumping from the River Murray, and the new desalination plant). This tool analyses the cost of different supply options and can generate a 30-day and two-year outlook to map how water can most efficiently be sourced.

A network operations model uses a hydraulic model of the network and connects it to live supervisory control and data acquisition (SCADA) information to predict the performance of every asset in the network at any point in time. This means that if there is an event, eg, a burst or water quality incident, the model can track what is happening in real time as well as predict the implications of the event on other assets.

A network status display brings all information across the entire network - across asset management, geographic information system, water quality, billing and meteorology - into one single portal to enable fully informed decisions to be made. Most water organisations tend to be siloed in their information management so having all of the relevant information together in one place is a unique and valuable capability.

New ground in water management and delivery

These tools are unique in that they not only enable real-time operational analytics - what is happening now across the network and how should we respond to it - but also predictive analytics - what will happen in the future. Combined, these tools give SA Water access to a wealth of information not previously available.

The technology has the potential to create significant operational efficiencies, in turn delivering customer service improvements and minimising costs. Other benefits likely to be realised include reduction in customers impacted by events, improved water quality event detection, improved reliability and transparency in decision-making, and real-time modelling and response to emergency incidents. Added to this, the depth and breadth of data generated by these tools will make regulatory compliance a much easier task for both regulators and utilities - a win-win for efficient water management.

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