THE FUTURE OF URBAN WATER: SCENARIOS FOR WATER UTILITIES IN 2040

D. Lambert[1], and J. Hargraves[2]

[1]Daniel Lambert, Water Business Leader Australasia, Arup, 201 Kent Street, Sydney, NSW 2000

[2]Josef Hargrave, Arup, UK

ABSTRACT

The Future of Urban Water: Scenarios for Water Utilities in 2040 depicts four plausible scenarios for the future of urban water utilities in 2040. Using Sydney as a reference city, the report explores how a wide range of social, technological, economic, environmental and political trends could shape our urban water future. By understanding drivers and planning for the future, water utilities can create more engaging customer experiences, enhance the livability of urban areas and get more out of their current and future assets. The scenarios can be used to explore the viability of different strategies, inspire innovation and assist in long-term planning for more sustainable and resilient urban water systems. We believe our population will be best served if water authorities migrate towards a hybrid model which incorporates greater decentralisation and autonomous management of water supply, greater participation of additional service providers and smarter management of the water grid.

KEYWORDS

Future, Urbanwater, Planning, Resilience, Decentralisation, Autonomous management

PRESENTER PROFILE

Daniel Lambert is passionate about developing and implementing smart and innovative solutions in the water sector. He is a Fellow of Engineers Australia, a member of the National Urban Water Reform Steering Committee, and was recently recognised by Engineers Australia as one of Australia's Most Innovative Engineers.

1 INTRODUCTION

Water is a precious and increasingly critical resource. The World Economic Forum's "Global Risks 2014" report identifies water crises as one of the top five global risks posing the highest concern. Water crises were ranked as the third biggest risk in terms of impact; however, strictly speaking, four of the identified top 10 risks are water-related — water crises, climate change mitigation and adaptation, extreme weather events, and food crises (World Economic Forum 2014). Despite this, water issues are often overlooked or misunderstood, and there is a need for better awareness of their social, economic and environmental impacts.

1.1 GLOBAL WATER SANITATION

Water scarcity is a vital challenge that must be faced in the coming years, but it is not the only challenge confronting global water supply. Pollution, rapid population growth and urbanisation are major factors posing fundamental challenges to the global water cycle, with a particular pressure on the urban water supply. Since 1950, cities have increased their water usage five-fold, not only through population growth but considerably through increased per capita demand. Meanwhile, there is increased decoupling of urban and rural systems and a diminishing holistic consideration of the global water cycle, with urban areas being considered as isolated entities. For cities to succeed in a world characterised by resource issues and constraints, we must recognize that cities don't exist in isolation.

Overlaying and intensifying all of these pressures is climate change, including rising temperatures, extreme weather events, rising sea levels, and reduction in river flows and groundwater levels. The exploding global demand for "water-heavy" goods including food and technological products is another critical factor, with agriculture already responsible for around 70% of freshwater withdrawals globally (UN Water 2014). The 2030 Water Resources Group predicts a global gap between safe freshwater demand and supply of 40% by 2030 if business-as-usual water management continues, thus not supporting the predicted population (2030 Water Resources Group 2013). With a possibility for water depletion and increasing competition through scarcity, new thinking and new ways of managing water become fundamental.

1.2 AUSTRALIA: CURRENT SITUATION

Challenges for water utilities in Australia include: meeting future demand for water in a changing climate, managing diverse sources of supply, ensuring the health of waterways and ecological systems, maintaining the affordability of water services and reducing the carbon footprint of urban water supply and use. Australia utilises over 50% of its water consumption for agricultural purposes and the remainder for household, industrial and commercial consumption. However, in urban areas, the main driver for demand remains the population, and thus population growth (Australian Academy of Technological Sciences and Engineering [ATSE] 2012). Despite Australia being the driest populated continent, the greatest amount of water per capita is used in global comparison (Savewater undated). Rainfall supplies most water sources in Australia, but future patterns of rainfall are likely to be highly variable and unpredictable due to the effects of climate change. Consequently, equitable access to sufficient water supply presents a key challenge (ATSE 2012).

1.3 DRIVERS OF CHANGE: URBAN WATER

The key drivers of change for the future of urban water fall into five categories: social, technological, economic, environmental and political.

1.3.1 SOCIAL

The global population is expected to reach around 9.5 billion in 2050. An estimated 90% of population growth is expected to occur in the cities of the developing world. This rapid urbanisation means that by 2050 around 70% of the global population will be urban dwellers. Australia's population is expected to rise 60% by 2050, from 23.3 million today to 37.6 million. Sydney and Melbourne's populations are projected to jump 60% to 80% to reach almost 8 million inhabitants each (Joyce 2013). Population growth and urbanisation pose great challenges to utilities — they must serve more people while facing greater scarcity of resources.

Another factor is an ageing population, due to an increase in life expectancy. In Australia over the next 40 years, the proportion of the population over 65 years will almost double

to around 25%. At the same time, growth in the population of traditional workforce-age is expected to slow to almost zero (Australian Government undated). This demographic change could lead to the need for different or shifting services, such as water for health care provision.

The digital lifestyle increasingly links consumers' lives to the internet. Smartphones are becoming the hub of our digital lifestyles, allowing us to constantly connect to social media, work and leisure activities. The trend towards a shared economy of service provision rather than product ownership means, for example, that consumers are increasingly likely to purchase access to a car rather than buy their own car. With growing connectivity and smart technology, people will be able to monitor the consumption and cost of water in real time. The availability of data provides an opportunity to educate customers about consumption and managing resource use. The possibility of technology to allow urban water trading could result in changes to demand system characteristics.

1.3.2 TECHNOLOGICAL

Smart infrastructure responds intelligently to changes in its environment to improve performance. It is estimated that the market size for smart grid technologies will almost triple by 2030. Smart water networks could save the industry US$ 12.5bn a year.

Many organisations are already using big data techniques and advanced analytics to manage complex processes and supply chains. It is expected that there will be a 4,300% increase in annual data generation by 2020 (CSC 2012). The analysis of big data can provide valuable information to help identify innovation opportunities, transform the management of assets, enhance interaction with customers and suppliers, and make sure that key risks to a business are proactively managed.

New technologies are promising to transform wastewater into a resource for energy generation and humidity into a source of drinking water.

1.3.3 ECONOMIC

Infrastructure finance has become a global business. While most infrastructure investments are local, the sources of finance are increasingly global. The Organisation for Economic Co-operation and Development (OECD) has estimated that around US$50tr would be needed worldwide in the period to 2030 to satisfy the global demand for infrastructure (OECD 2006). However, accessing sources of funding is an increasing challenge. In the United States, for example, water infrastructure investment is not keeping up with demand. If current trends continue, the investment needed by 2040 will amount to US$195bn and the funding gap will be US$144bn (American Society of Civil Engineers, 2011).

The cost of infrastructure could lead to the financial recycling of assets and capital, where old assets are sold or leased to fund the new. It could also lead to greater application of the circular economy, which will help stretch resources through end-of-life recycling and reuse. New technologies and processes are increasing our ability to recycle more and more material goods.

As business strives to differentiate itself and customer expectations increase, the need to innovate around the consumer experience is becoming a critical factor for good design.

The desire for greater choice and more customised services can lead to greater complexity. For water utilities this could mean a different way of doing business that challenges traditional thinking and processes to include more engagement with the

public, more transparency, shared ownership/IP, responding to new ideas, forming partnerships, and engaging with customers through social media.

With increasing scarcity and cost of natural resources, efficiency is a driving force for manufacturing companies. Manufacturing expenditures on raw materials, energy and water can be as much as 50% of total manufacturing costs. Green manufacturing can improve energy productivity and operational efficiency by switching to less water-intensive equipment and minimising waste. Another way of increasing efficiency is through coopetition. Coopetition occurs when companies forge alliances across traditional boundaries, for example in order to share common costs. Coopetition could enable utilities to be more agile through the sharing of experiences and by not holding a monopoly on good ideas, as pooled resources can drive efficiency and innovation. Coopetition could move the idea of the smart house and smart city closer to reality.

Urbanisation is one of the key factors affecting growth in energy demand. World energy consumption is projected to grow by 56% between 2010 and 2040. Approximately 90% of global power generation is water intensive (UN Water 2014). Therefore, a country's energy mix has fundamental implications for its water industry.

1.3.4 ENVIRONMENTAL

Climate change has led to changes in climate extremes, including increasing temperature variability and more heat waves with record high temperatures. It also includes increasing rainfall variability with heavier, shorter-duration events along with extended droughts. Sea level rise is also a concern as around 10% of the world's population lives in coastal areas less than 10 metres above sea level, and is therefore vulnerable to rising sea levels.

Climate change policy has developed around two themes: mitigation and adaptation. Mitigation is tackling the causes of climate change through the reduction of greenhouse gas emissions. Adaptation is adjusting to the impacts of climate change, by reducing vulnerability and increasing resilience. Both bear an economic cost, and both approaches will shape efforts to avoid the worst of climate change. Water utilities need to assess their stormwater and sewer systems capacities due to intensifying storms and increased rainfall. The requirement for systems to be resilient could lead to a new lens for decision-making, looking at new risks with new measurements.

1.3.5 POLITICAL

Water security is the capacity of a population to access sufficient water to meet all its needs and to limit the destructive aspects of water. It involves both the productivity and destructivity of water. By 2030, almost half of the global population of 7.5 billion people is predicted to live in areas suffering from severe water scarcity. Compared to current figures, this reflects an increase of over 1 billion people experiencing a lack of water (The World Counts [A] undated). Water pricing is being recognised as an acceptable policy instrument to respond to increasing water scarcity. Diversifying water sources helps to secure water supply systems against droughts and floods. Alternative supply options include recycling existing water, such as sewage and stormwater, as well as manufacturing new water through desalination.

Water policy and regulation are typically determined on a state or national rather than international level. In Australia, state and local governments have the ability and opportunity to integrate urban water planning more effectively with urban development planning in order to increase efficiency and create more liveable urban environments (Water Services Association of Australia 2013).

A strong international consensus now exists among scientists that human-made climate change is a reality and warrants serious action. Global public opinion varies on the issue. If it were to shift markedly, for example in response to a major climate change event, then politicians may force through aggressive legislation to constrain emissions further. Changing customer expectations on levels of service could force a policy intervention.

2 SCENARIOS

Scenarios provide a unique opportunity to explore and compare alternative plausible futures. They are an effective engagement and communication tool that enables us to gain a better understanding of possible pathways towards the future of urban water utilities, including the role of different stakeholders and alternative system designs. Future scenarios build upon a well-grounded understanding of current and future trends and global benchmarks. They present a tool for strategic thinking through which we are able to make sense of uncertainty and explore future options. Scenario modelling enables businesses to develop robust and resilient business strategies as well as meaningful stakeholder engagements. The scenarios in this report are intended to picture possible future worlds while describing the challenges and opportunities facing the water sector specifically, as well as the global water cycle in general. Scenarios assist in identifying and developing actions and strategies towards achieving a preferred future.

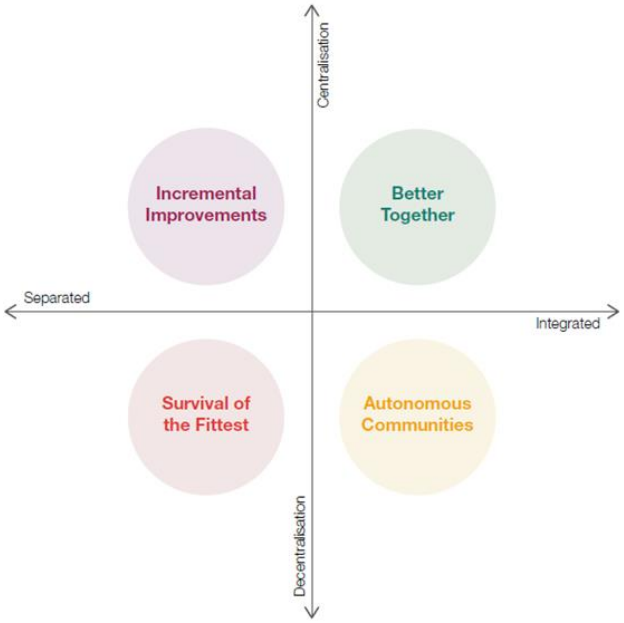

Figure 1: Scenario Variables

The variation in future urban water utility systems and experiences largely reflects two critical variables: the extent of centralisation and integration in future urban water utilities as shown in Figure 1.

2.1 INCREMENTAL IMPROVEMENTS

Incremental Improvements describes a world with little change to existing assets and operations. A centralised water supply system with a separated provision of utilities.

Figure 2: Incremental Improvements Scenario

The global economy is growing, albeit slowly. Governments and businesses have not done enough to curb greenhouse gas emissions and the effects of climate change are becoming increasingly severe. Cities are facing problems to source adequate food for their growing population. Australia is experiencing an increase in droughts with more frequent hot days and nights. Sydney is faced with reduced precipitation and increased summer heat waves. Climate change adaptation measures are local and reactive. Through not recognising macro-trends, an opportunity has been lost to address broader outcomes. Energy is expensive and there is still an over-reliance on fossil fuels, both at the global and national level. A failure in reducing greenhouse gas emissions has led to a higher

than expected sea level rise, posing huge challenges to Sydney. However, due to the implementation of new and advanced technologies, it became possible to adapt to the consequences of climate change.

Sydney has kept its infrastructure investments to a minimum to retain profits under restrictive pricing, resulting in deteriorating systems and rising operational costs. Australia's relatively tight regulatory environment has created barriers to new entrants across the utilities sector, exacerbated by expensive energy while transporting and treating water and wastewater still requires large amounts of energy. Almost no collaboration between utilities is happening and customers are disengaged. Those investments happening in regard to water use efficiency and security of supply are mainly driven by resource constraints and regulatory pressures. However, as utilities are still operating in isolation, an effective overarching strategy of reducing resource consumption wasn't implemented as of yet. Businesses are still only reacting to financial incentives and legislation.

The water sector has used demand management through usage restrictions to manage capacity and performance during supply constraints. As to support this management, smart technologies are implemented in small parts. Furthermore, some parts of Sydney have installed energy and water efficient infrastructure, together with incremental developments in green infrastructure. Sydney has installed smart metering in households, which helped in reducing domestic water consumption. Because of climate change a handle on customers' behaviour is kept and some disposal targets and grades have been implemented. This has brought about incremental improvements to the performance of existing assets and systems despite disengaged customers not caring enough about water issues and still embracing in an established throw-away culture. Water planning is heavily compromised by a lack of agreed and clear objectives for utilities and by political intervention in planning options and decisions. Infrastructure considerations are still left behind in the urban planning sphere. This results in Sydney's water system still operating in a more linear, rather than a circular way. Utilities are still primarily focusing on water supply and cost control without fundamentally rethinking consumption patterns.

2.2 BETTER TOGETHER

Better Together pictures a scenario where industry and utilities better collaborate across a centralised system. A centralised water supply system with an integrated provision of utilities.

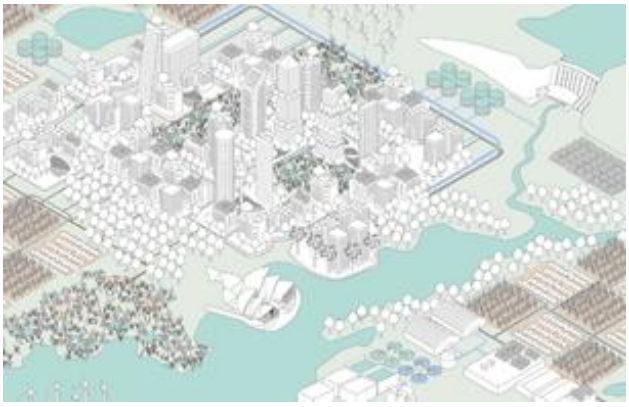

Figure 3: Better Together Scenario

Continued globalisation and investment in new energy technologies have boosted the global economy. There have been a series of coordinated and binding efforts, globally and regionally, to curb carbon emissions and limit environmental impacts. However, Australia is still experiencing reductions in precipitation long after greenhouse gas emissions have ceased.

Sydney's planning system is driven by a commitment to integrated planning as well as strict regulations to ensure compliance with global targets. Resource use is monitored and there is a drive for reuse and recycling. Sustainable, renewable resources have been identified and exploited and there has been a concerted drive towards zero waste and the circular economy. Australia became a strong player in wind and solar energy and strong local governance ensured that Sydney has become a low-carbon city. The city has

minimised its energy and water use and its waste generation and thus halved its greenhouse gas emissions. Recycled water, stormwater harvesting and reuse became a standard. Seawater desalination is being increasingly used as a reliable source of water. Due to the implementation of new techniques as well as early actions on infrastructure improvements, Sydney is now able to meet a considerable amount of its water demand through local sources and its infrastructure and dam capacity is able to keep up with population and demand. Green infrastructure is increasingly favoured over man-made, engineered solutions with a focus on liveable urban habitats, achieving a better infrastructure resilience and stormwater management, linking urban and rural areas.

Infrastructure hubs were implemented across the city and as a result there has been greater industry collaboration, especially within the water, food, energy and waste sectors. Significant strategic and coordinated investments have been made to network utilities, in order to maximise synergies by integrating assets and sharing information and protocols more effectively. Small-scale water reuse is also happening on the household scale, but the majority of services are still provided through central suppliers and their resources.

Complex and integrated water supplies are managed by smart grids and systems. Advanced technologies for water capture, storage and monitoring are widely deployed. Smart metering is implemented across Sydney, resulting in growing use of real-time data. Customers, households, industries and the landscape are integrated, resulting in Sydney operating as a big living organism. The customer experience is focused on improved transparency and efficiency, and, as a result there has been a reduction in demand, as people are engaged with the utility providers and the system and are careful about their resource usage. Events and campaigns around behaviour change are held and people are briefed on how to live green. However, governments still rely heavily on policy to change how businesses work and how people live their lives. Individuals were forced to scale down consumption. The cost for infrastructure has shifted to the consumer, which meant rising energy and water prices.

2.3 AUTONOMOUS COMMUNITIES

Figure 4: Autonomous Communities Scenario

Autonomous Communities is a world in which households, communities and industry developed independence in water collection, processing and distribution while considering the interrelation of water, energy and food systems. A decentralised water supply system with an integrated provision of utilities. The international community has coordinated efforts to combat advanced climate change. While weather patterns remain unpredictable, it is widely thought that the worst of climate change has been avoided. Despite the fact that a global agreement on the necessity to combat climate change was reached early in time, no binding global deal was achieved. Thus, communities started to look for solutions on the local scale and customers realised that a disconnection from the system might be beneficial for them. This has led to a focus on alternative energy and autonomous systems.

Although greenhouse gas emissions have been halted and the economy has shifted to a green economy, Sydney still has to deal with the impact of global warming, due to the huge amounts of emissions that have been put into the air in earlier times. High prices and constrained supply forces individuals to maximise efficiency and decrease their

dependence on national utilities. As a result, urbanisation has been stabilised in favour of a more sprawled way of living. More focus is put on existing assets, with resettling taking place and people being closer to where their commodities are produced along with commodities being increasingly produced closer to existing settlements.

These new systems are often at the scale of households, communities, and industry clusters. Production and consumption are driven by the desire to be autonomous and operate on the local scale. A spirit of a circular economy is driving all decision-making. People are better harnessing linked systems, with food production, water and waste treatment and energy production being operated in a closed circle. Local renewable energy generation and decentralised grids have superseded coal, gas and oil.

Sydney has become a more resilient city with individuals adjusting creatively to the unavoidable consequences of climate change. Communities increasingly embrace urban agriculture, growing food on and between buildings. Houses and apartment blocks have their own water harvesting, recycling and purification, and recycled water became a standard. Through treating and sourcing water locally, Sydney was able to significantly reduce the amount of energy and infrastructure needed to perform these tasks.

Power resides at the community level, utilising computer-based collaborative tools. Independent customers are operating connected or disconnected small water networks. Communities engage with the water industry for trading, information, system design, and maintenance. There is, however, no supplier of last resort. Sydney has become more informal. Individual customer relationships are facilitated through open data, crowdsourcing and the sharing economy, benefiting from favourable attitudes towards data sharing. DIY and collaborative consumption is prospering and users are more acquainted and willing to use resources according to availability. Sydney's communities managed to achieve a closed system with little water going to waste. They are focusing on conserving, efficiency and reuse of water. Monitoring, sensing and metering is deployed and people's skills and talent is harnessed to its full extend. A strong focus is put on alternative means of water treatment such as reed beds and wetlands, aeration and solar water disinfection.

2.4 SURVIVAL OF THE FITTEST

Survival of the Fittest paints a scenario with greater competition for limited resources and restrictions to supply with high disparities in usage behaviour and access. A decentralised water supply system with a separated provision of utilities. The global economy is in a prolonged period of recession. We are experiencing a world that woke up late to climate change, a world with greater water stress and resources only available for those who can pay for it.

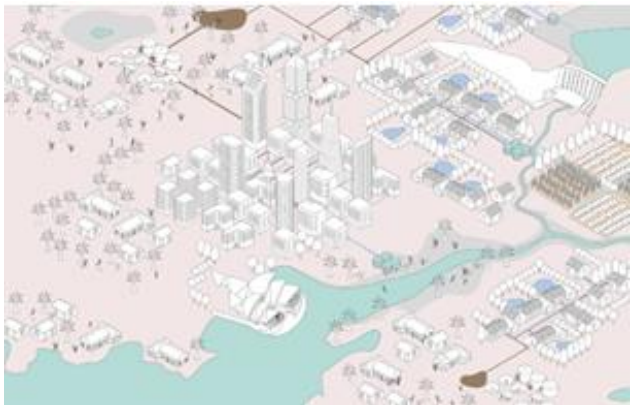

Figure 5: Survival of the Fittest Scenario

Sydney is experiencing severe water shortages with periodic supply disruptions and population growth has been restricted by availability of water and land. The environmental system considerably suffered from environmental degradation and depletion. During this time competition for capital and investment has been acute. Poor economic and environmental conditions have created clusters of haves and have-nots within the Australian society. As a result of water scarcity, Sydney has implemented strong restrictions on consumption and supply, forcing conflicts for water and resources at the local scale. The government thus enforces more decision on people's lifestyles. Life in Sydney is tough and major parts of the formerly flourishing city centre of Sydney have

been abandoned in people's search for available resources. Thus, large-scale resettling is happening which resulted in the urban population being lower than estimations predicted. The black market for water is a reality and informal economies are prospering. For those who weren't fortunate enough to build-up their own system, with no regards to planning or legal rights, water rationing and a constant fight for water and resources are daily fare.

The lack of cooperation has limited opportunities for the efficient management of networks, while simultaneously suffering from a lack of skills and talent. Government planning and policy has proved woefully short-termist with just enough of the basic infrastructure being maintained. However, the major part of an ageing water infrastructure is in need for upgrade, putting increasing pressure on capital needs. Local water supply and treatment companies compete for control over critical infrastructure and sources of supply. At the community level, no one is willing to share resources anymore. Groundwater is used with little concern for others, people use as much as they can once they have access. All available sources are identified and exploited and consumer behaviour is driven through accessibility. Despite increasing resource scarcity, consumption hasn't been cut down, it is just distributed unequally and all resource usage is driven by who is the fastest and who can pay for it.

3 DISCUSSION

Each of the scenarios carry implications for urban water utilities, in particular concerning customer experience, infrastructure and governance. The impact on each of these aspects of urban water utilities has been explored in the context of each scenario.

3.1 INCREMENTAL IMPROVEMENTS - IMPLICATIONS

Customer:

- Focus on customer services that are user-centric and that provide greater personal choice and control over service levels and pricing;
- Expansion of water services that focus on meeting the requirements of individual customers and that engage people at the community level; and
- Demand for higher levels of transparency and information in relation to metering, billing and customer satisfaction.

Infrastructure:

- Increased deployment of digital infrastructures and data analytics to manage, reduce or eliminate system peaks and fluctuating demand patterns;
- Deployment of sensing technologies and metering to increase the quantity and quality of system information and enable real-time applications for asset management and customer service; and
- Greater focus on existing assets, energy performance, and integrated infrastructure as part of maintenance and operating plans.

Governance:

- Higher levels of coopetition and integration between water, energy and telecommunication companies with a focus on integrated planning and maintenance;
- Focus on deregulation and greater competition, both within the water sector and across complimentary utilities; and

Strategic focus on upgrading, improving and digitising existing assets in order to achieve better customer engagement and service feedback

3.2 BETTER TOGETHER - IMPLICATIONS

Customer:

- Emphasis on creating a seamless customer experience across multiple integrated utilities, including shared billing, pricing and customer services;
- Focus on maximising customer satisfaction and engagement through digital experiences, gamification and community-based water systems; and
- Exploitation of synergies between multiple utilities and service offerings, with a focus on finding more efficient ways to meet customer requirements.

Infrastructure:

- Integration and sharing of assets and infrastructure across multiple utilities, including water, energy, waste and telecommunications;
- Creation of smart and self-learning water distribution networks that is enabled by sensors and automation across water collection, processing, distribution and consumption; and
- Implementation of green infrastructure solutions on a city and regional scale, with a focus on minimising the impacts of droughts, flooding and storm water.

Governance:

- Better cooperation between urban utilities through collaborative planning, integrated asset management, shared protocols and open data;
- Emergence of third-party service providers that focus on integration and cooperation between customers, systems components and utility providers; and
- Increase in prices for service provision in order to enable investment in infrastructure improvements, coupled with a higher number of investments that are shared by multiple utilities.

3.3 AUTONOMOUS COMMUNITIES - IMPLICATIONS

Customer:

- Greater focus on services that enable customers to manage and maintain autonomous water systems at building, community or cluster level;
- Shift from customers that pay for the delivery of services to those that pay for the cost of installing and maintaining local infrastructure, either individually or collaboratively; and
- Utility services focus on assisting with end-user system design, installation, information, maintenance and emergency response.

Infrastructure:

- Provision of planning and infrastructure services that enable communities to develop, run and maintain autonomous urban water systems;
- Shift to clusters of autonomous and self-regulated water networks that operate at a building or community level, independent of the wider grid; and
- Increased deployment of digital infrastructure to facilitate resource trading and information sharing across a large number of autonomous urban water networks.

Governance:

- Governance and operation of autonomous systems and small-scale water networks through cooperatives, virtual networks and community platforms;
- Change in legislation and building regulations to enable greater autonomy and smaller-scale applications in water collection, storage, treatment and distribution; and
- Increase in small- and medium-sized utilities that focus on providing information, system design, installation, and maintenance services to autonomous communities.

3.4 SURVIVAL OF THE FITTEST - IMPLICATIONS

Customer:

- Development of applications to provide customers with real-time data and information about water consumption, availability and pricing;
- Increased disparity in the type of water services delivered to urban customers as service models are increasingly influenced by variable pricing and service packages; and
- Usage of smart technologies within households, industry and networks to enforce, monitor and control efficient use, distribution and recycling of water.

Infrastructure:

- Expansion of technology and systems to manage and minimise the impact of extreme fluctuations in water availability, including fast shifts from too much water to too little;
- Focus on advances in decentralised and centralised water storage solutions, coupled with intelligent demand management and higher water recycling and reuse rates; and
- Increased focus on monitoring and reducing illegal water trade and theft, coupled with a reduction in leakages and wastage across the existing network.

Governance:

- Implementation of differential water pricing and services according to availability of supply, service plans, and customer behaviour;
- Greater focus on autonomous and community-based water systems, where service and infrastructure levels are determined by private investors and income power; and
- Resettlement of communities and industries into areas where resources are available and risks associated with urban water scarcity are reduced.

4 CONCLUSIONS

The explored drivers of change and future scenarios studies reflect the necessity for water utilities to be prepared to operate and succeed in a world that will likely be utterly different than the world we are experiencing today. Cities across the globe will increasingly have to focus on local water sourcing, reuse and recycling in order to sustain their population. Consequently, they have to move away from their reliance on external sources while considering the global water cycle. Water utilities need to be prepared to serve more people in the future while simultaneously dealing with an increasing scarcity and competition for resources.

The full report is available here:
http://publications.arup.com/publications/f/future_of_urban_water

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