



The future of urban water:

Scenarios for urban water utilities in 2040

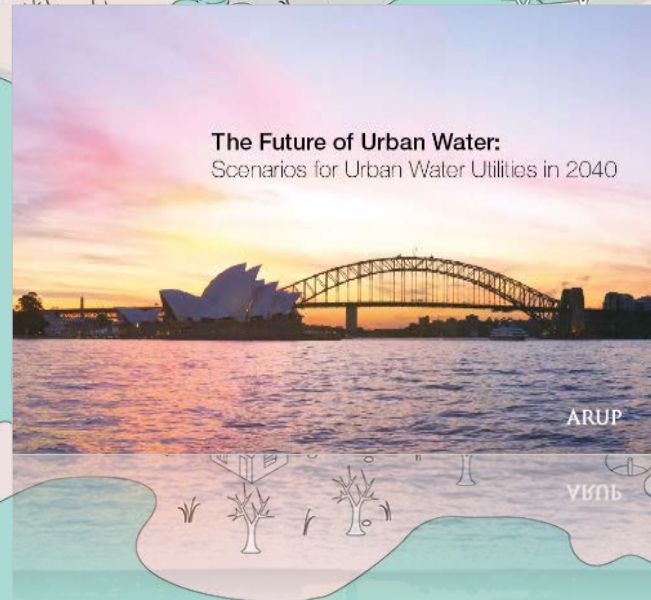
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The Future of Urban Water: Scenarios for Water in 2040

The programme explored trends and future scenarios for the future of urban water in 2040.



Arup *The Future of Urban Water* publication is the result of a jointly funded collaboration between Arup and Sydney Water



Purpose

To undertake a process where we considered possible scenarios for the future and the likely impact on the water utilities.

This then provides a framework for utilities to consider these scenarios in their planning process, to understand the associated risks and opportunities and consider how to respond to them.



Scenario Assumptions

Informed assumptions, derived from the drivers of change that are most likely to occur, form the baseline for the future scenarios.

All scenarios are based upon these overall assumptions, making it possible to explore and compare different futures under clearly defined conditions.



Scenario Assumptions

Developed world:

Scenarios take a developed economy as a baseline

Urbanisation:

Continuing growth of urban populations

Climate change:

Evidence of increasing frequency and intensity of extreme weather events

Volatility:

Volatility in supply of water resources and overall increasing resource scarcity

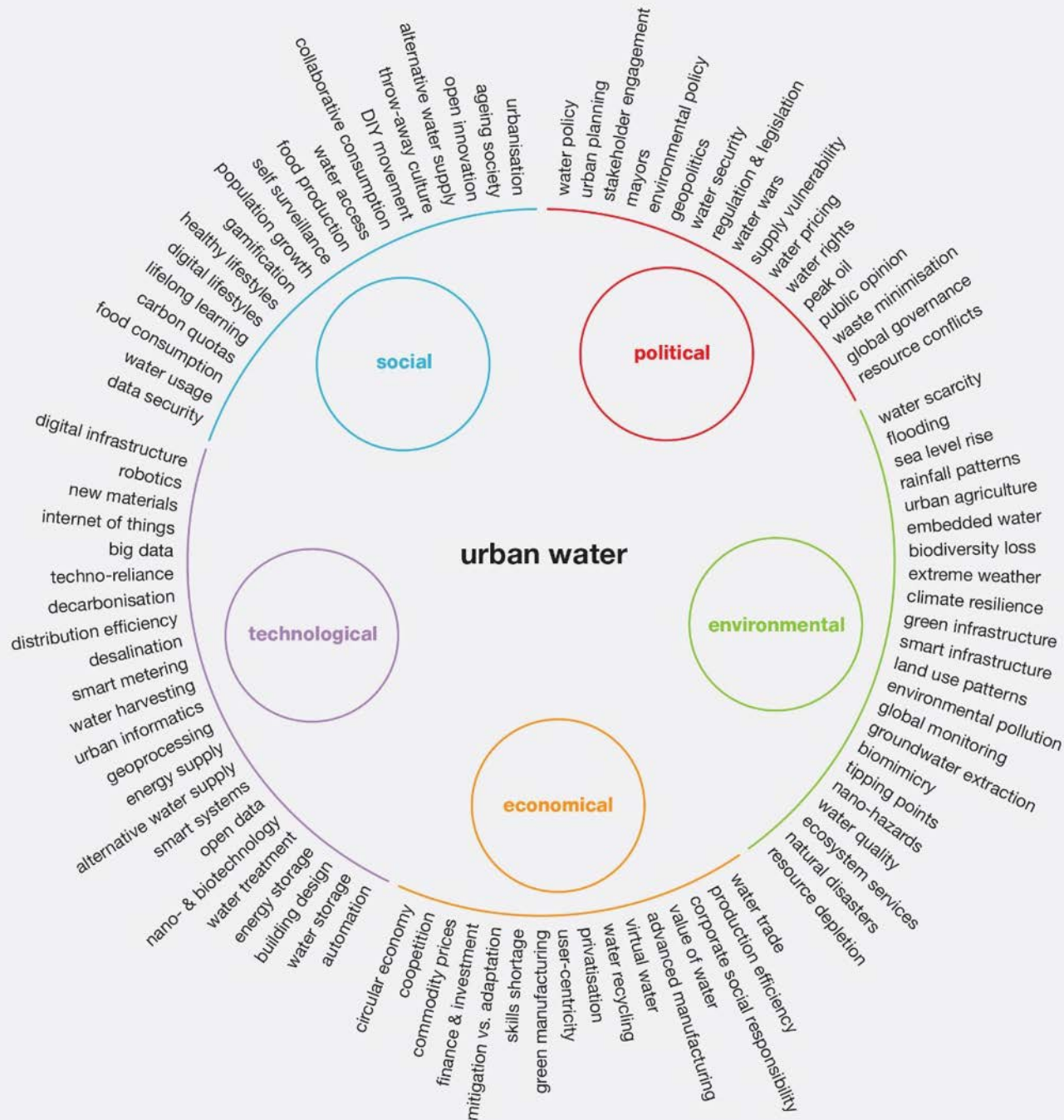
Efficiency:

An efficient management of the utility is assumed, independent of who owns it

Smart utilities:

A shift towards smarter utilities and technological progression is assumed

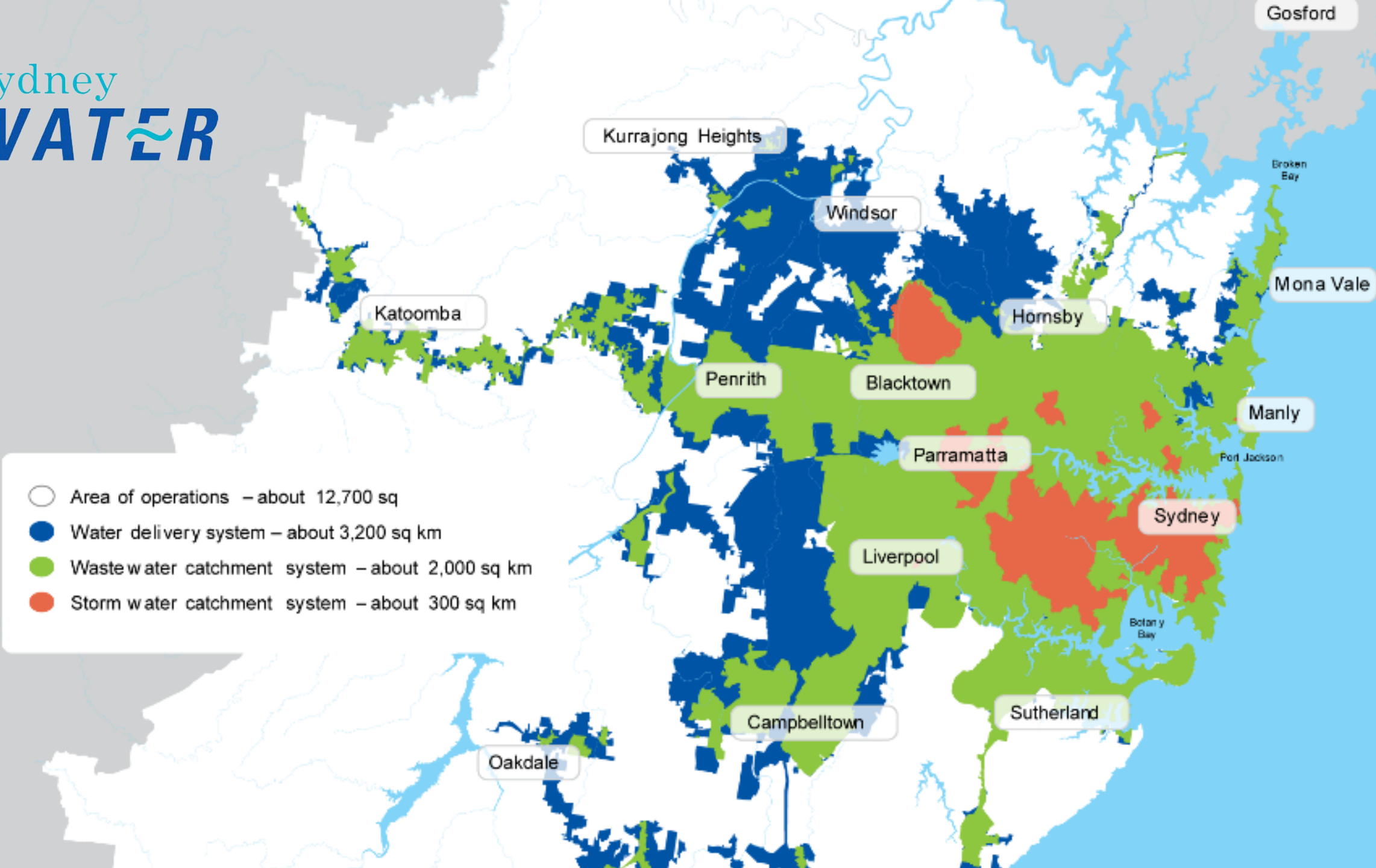
Drivers of Change: Urban Water



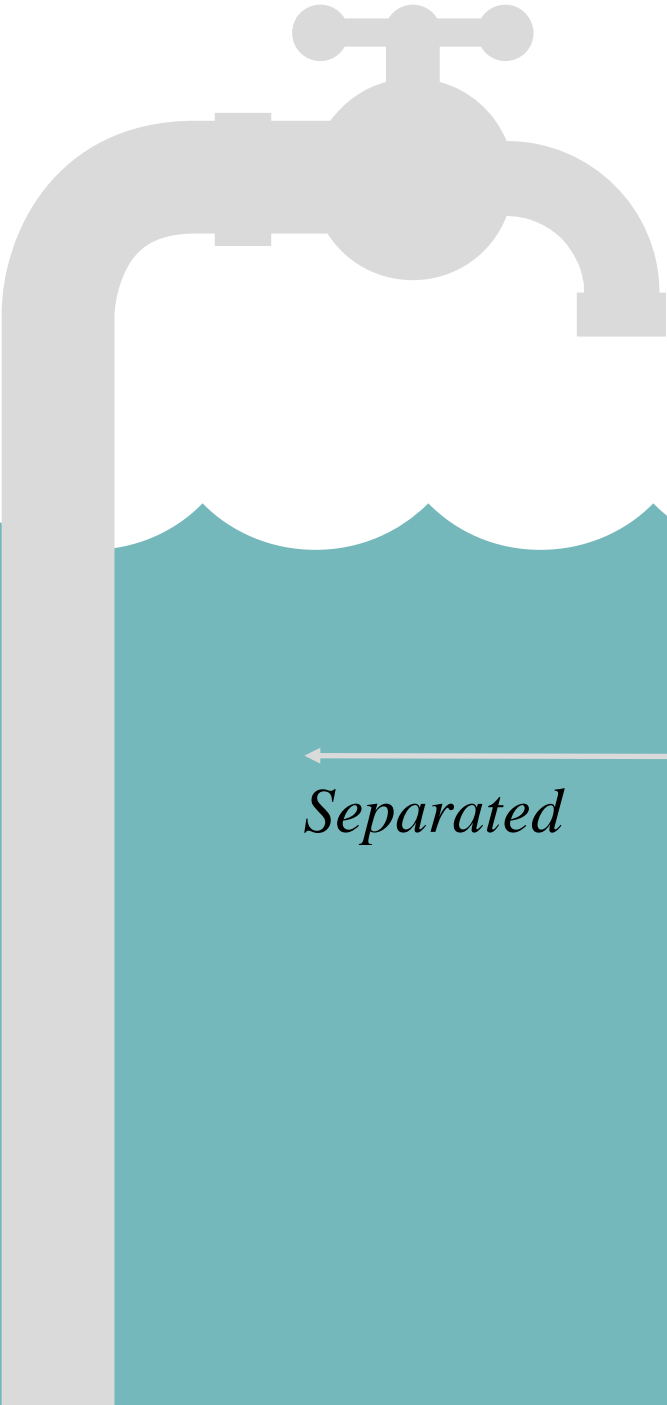
This section identifies some of the global drivers of change linked to the future of urban water utilities, including the future of urban water access, supply and services.

We identified around 100 trends, from global megatrends to sector-specific drivers. A full list of drivers, designed as workshop cards, researched and written by Arup's Foresight + Research + Innovation team, is shown in the diagram on the left.

Sydney WATER



The Approach



Incremental Improvements

Better Together

Survival of the Fittest

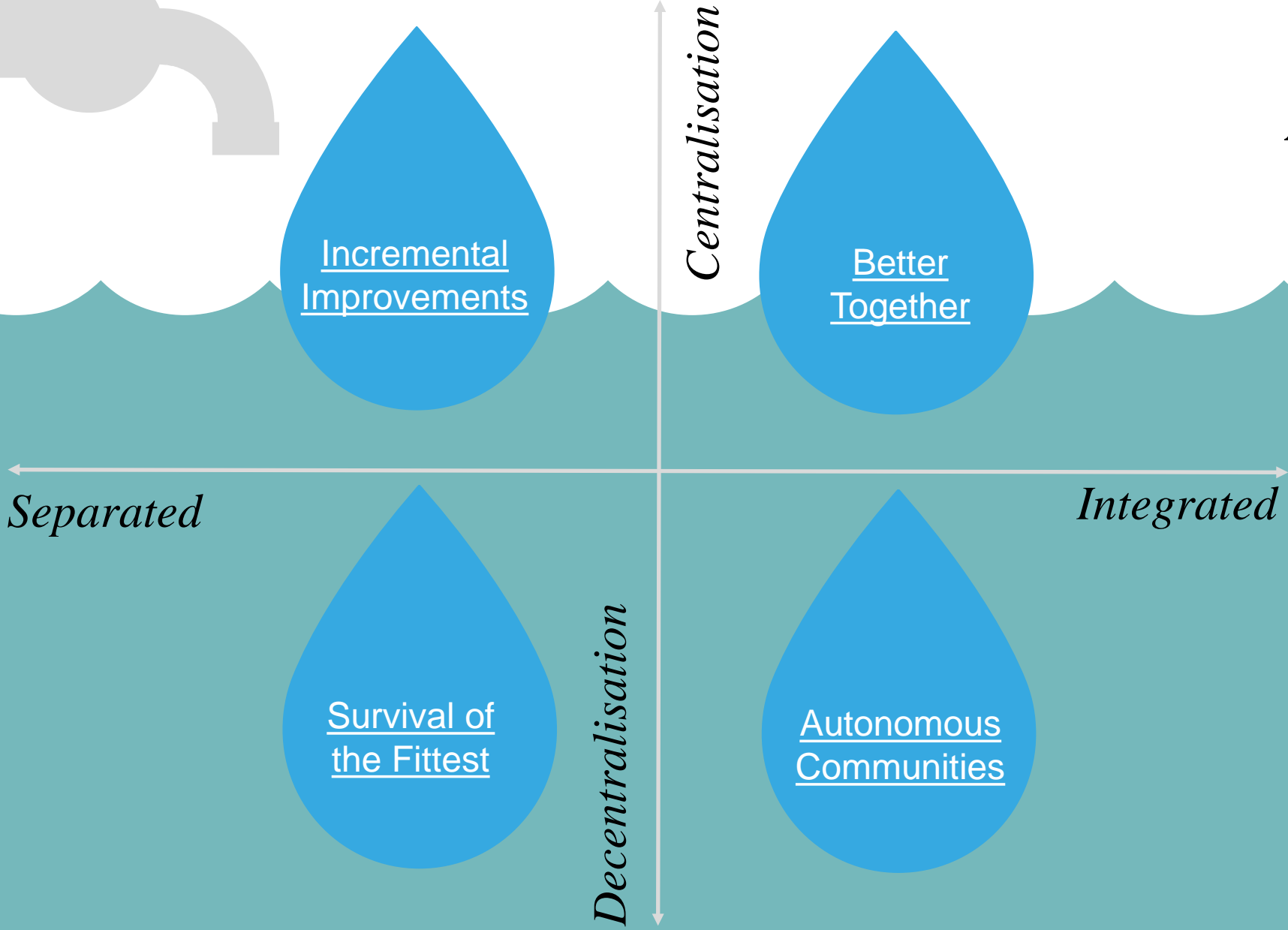
Autonomous Communities

Centralisation

Decentralisation

Separated

Integrated



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.



Economy

Slow economic growth coupled with economic uncertainty



Energy

Continued overreliance on fossil fuels, but some expansion in renewable power generation



Consumers

Price driven consumption with little customer engagement and little concern for sustainability



Resources

Focus on efficiency, driven by price and scarcity, but little behaviour change at the consumption level



Industry

Focus on profit maximisation and conforming to regulation



Environment

Unpredictable and extreme weather conditions continuously challenge the resilience of urban systems in need for upgrade



Technology

Focus on resource efficiency through limited deployment of smart solutions and utilisation of advanced technologies to deal with the consequences of climate change



Governance

Regulatory environment focuses on facilitating economic growth and reactive climate change related measures

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.



Economy

Moderate to high economic growth driven by investment in clean technologies



Energy

Maximised use of renewable energy, fully integrated with water and food supply



Consumers

Engagement between consumer and utilities enabled by smart systems to reduce consumption



Resources

Use of resources is monitored and there is a drive for reuse, recycling and avoidance



Industry

Focus on resource efficiency, circular economy, competition, and coordinated investments



Environment

Green infrastructure increases the resilience of urban systems while still having to deal with consequences of climate change



Technology

Application of smart systems to enable efficiency and effective integration across utilities and customers



Governance

Regulatory environment focuses on facilitating effective cooperation across utilities and efficiency measures

Autonomous Communities

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.



Economy

Moderate to high economic growth and an increase in independently operating businesses



Consumers

Customer experience focused on independence, sharing, open networks and resource efficiency



Industry

Clusters, autonomous systems and resource trading across industries with a focus on circular systems



Technology

Virtual management of a decentralised network and increased use of data and advanced technologies on the community scale



Energy

Dominated by small-scale and decentralised renewables operated by virtual power plants



Resources

High resource prices and increasing scarcity foster local systems, including collection and supply



Environment

Unpredictable weather conditions with green infrastructure measures implemented on the local scale dealing with weather events



Governance

Focus on local and regional governance and a collaborative model

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.



Economy

Prolonged period of recession and a lack of investment increases competition for capital and resources



Consumers

Accessibility and price-driven consumer behaviour increases inequality



Industry

Lack of reliable water supply forces extreme efficiency measures and some private water networks



Technology

Smart technologies are deployed to monitor and control the restricted water consumption



Energy

High energy prices and a failed shift to renewables



Resources

Utilities fail to manage supply constraints effectively forcing restrictions on resource usage



Environment

Continued environmental degradation and frequent extreme weather events, including an increase in droughts



Governance

Strong restrictions on consumption and supply with access rights at the city scale

Implications across Scenarios

Customers

Infrastructure

Governance

Focus on customer services that are user-centric and provide greater personal choice and control over service levels and pricing

Increased deployment of digital infrastructures and data analytics to manage, reduce or eliminate system peaks and fluctuating demand patterns

Higher levels of cooperation between water, energy and telecommunication companies with a focus on integrated planning and maintenance

Incremental Improvements

Emphasis on creating a seamless customer experience across multiple integrated utilities, including shared billing, pricing and customer services

Integration and sharing of assets and infrastructure across multiple utilities, including water, energy, waste and telecommunications

Better cooperation between urban utilities through collaborative planning, integrated asset management, shared protocols and open data

Better Together

Greater focus on services that enable customers to manage and maintain autonomous water systems at building, community or cluster level

Provision of planning and infrastructure services that enable communities to develop, run and maintain autonomous urban water systems

Governance and operation of autonomous systems and small-scale water networks through cooperatives, virtual networks and community platforms

Autonomous Communities

Development of applications to provide customers with real-time data and information about water consumption, availability and pricing

Expansion of systems to manage and minimise the impact of extreme fluctuations in water availability, including fast shifts from too much water to too little

Implementation of differential water pricing and services according to availability of supply, service plans and customer behaviour

Survival of the Fittest

New Zealand
Water Consumer
Survey 2017
REPORT



water
NEW ZEALAND
The New Zealand Water & Waste Association Waiora Aotearoa

Customer focus: New Zealand National Water Survey 2017

The New Zealand Water Consumer Survey is the first nationwide examination of what New Zealanders think about critical issues associated with water.



The Future of Urban Water: some themes for the future

What will cities look like in 2040 and what
role will water play?

Customer

Liveability

Technology

Decentralisation

Governance & ownership structures

Non-regulated business opportunities

Community Engagement: Crowd Sourcing

+Pool
New York, USA



Connection with water not separation

Gaochun National
Wetland Park
Artificial Lake, China



A hybrid model for water supply: decentralised & centralised systems

Melbourne Park
Stormwater Harvesting
Melbourne, Australia



International best practice – sharing of ideas

London 2012 Olympic
Park, UK



Trends in practice

Main Outfall Sewer -
Integration



WORK IN PROGRESS



Trends in practice

Main Outfall Sewer -
Integration



WORK IN PROGRESS

Water as a place: Bradford City Park

(multi-government stakeholder engagement)

Bradford City Park



Day



Night





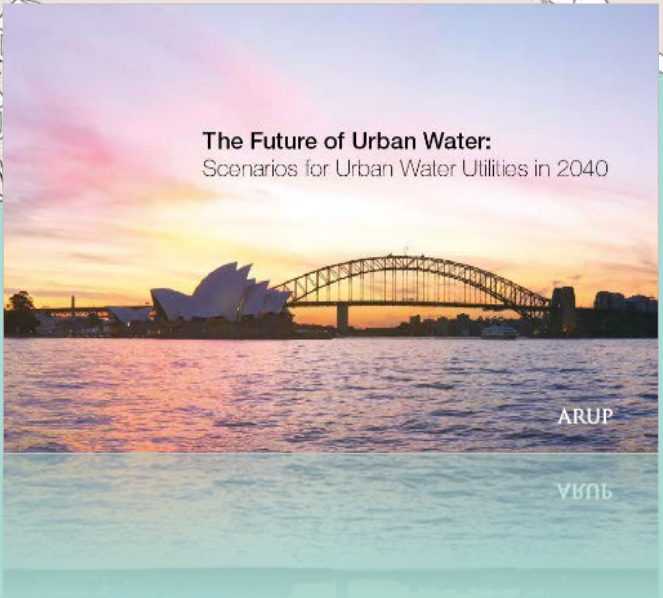
Applying technology to the water sector

Aquarevo “Talking Tanks” Development, Melbourne, Australia





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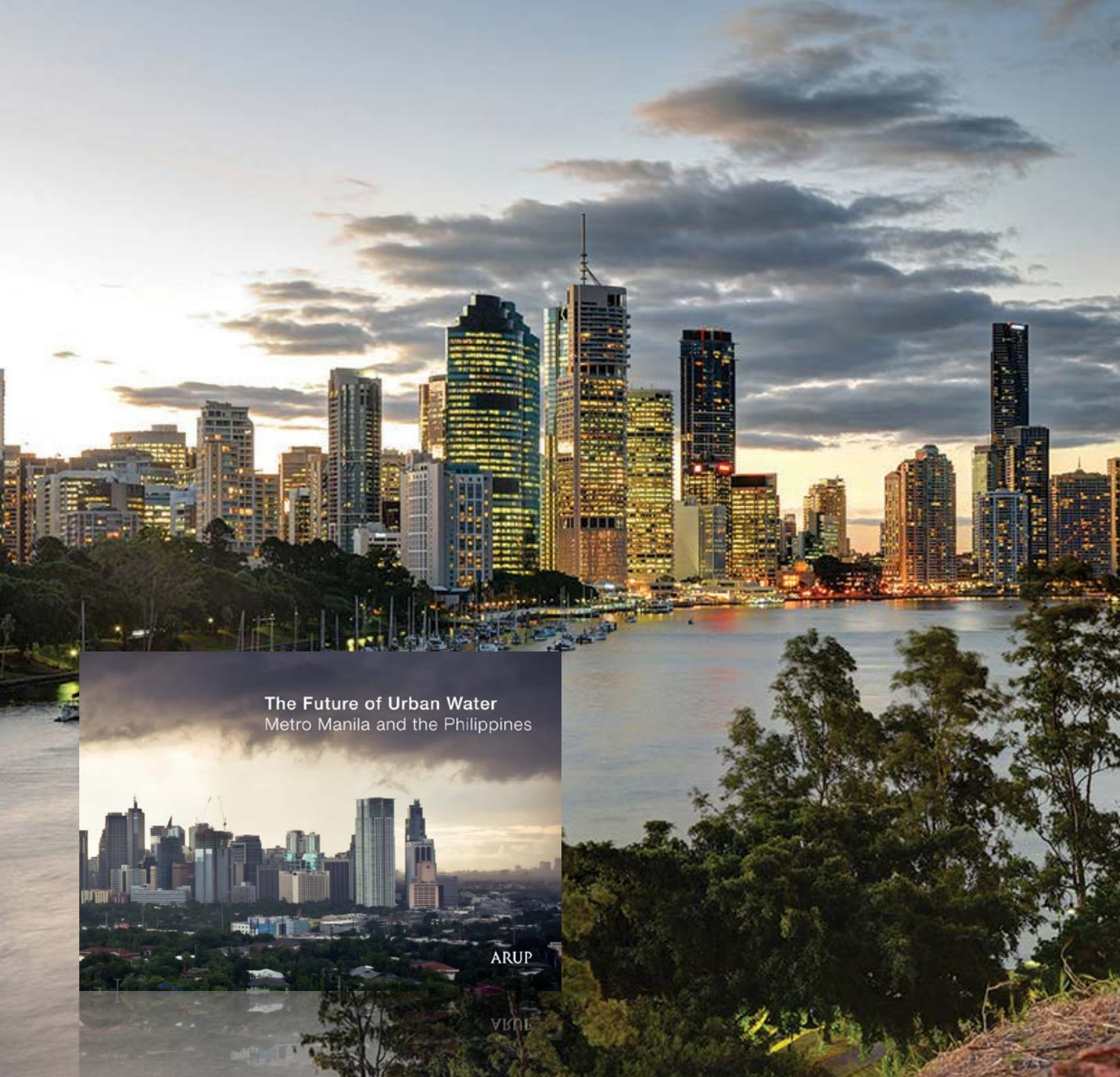
VIB6

Outcomes

Regionally and Globally

We have developed, enhanced and customised the scenario planning approach for utilities throughout Australia and globally.

We have delivered similar studies for utilities in Australia, Asia, USA and Europe.



The Future of Urban Water
Metro Manila and the Philippines

ARUP

VBN

Next Steps



What's Next:

It is great that this approach has been picked up in other parts of the world but what is the next step?

Where do we need to go next in terms of our approach with utilities?

Future of Digital Water:

We are currently in the process of developing a new customer value proposition for the water sector





The Future of Urban Water: Conclusion

Engagement with customers

Water as a place

Ownership models

Water pricing

*Integration of decentralised and
centralised models*

Potential integration with other utilities



Thank you

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