Future Urban Water Challenges

Evolution or Revolution?

Bath University – 19 January 2017

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Future Urban Water Challenges
Evolution or Revolution?

Understanding the context – the ‘Drivers of Change’

How did we get here?

Taking an Integrated Water Management approach

Working in Collaboration

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We are truly global. From more than 90 offices worldwide our 13,000 planners, designers, engineers and consultants deliver innovative projects around the globe.


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Sydney
Adelaide
Auckland
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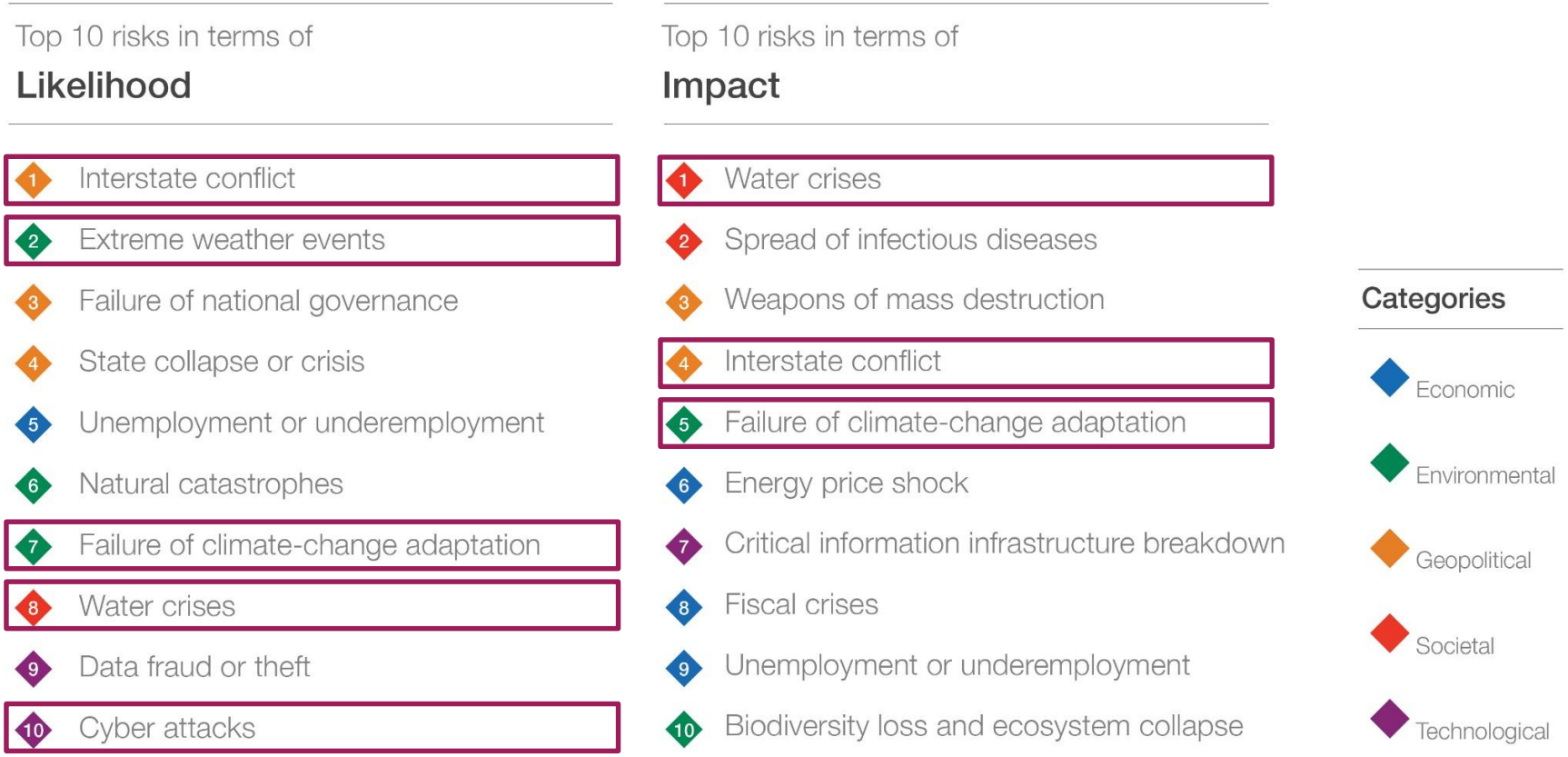
Context
Drivers of Change

World Economic Forum 2015



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Water Drivers of Change

Population growth

Urbanisation

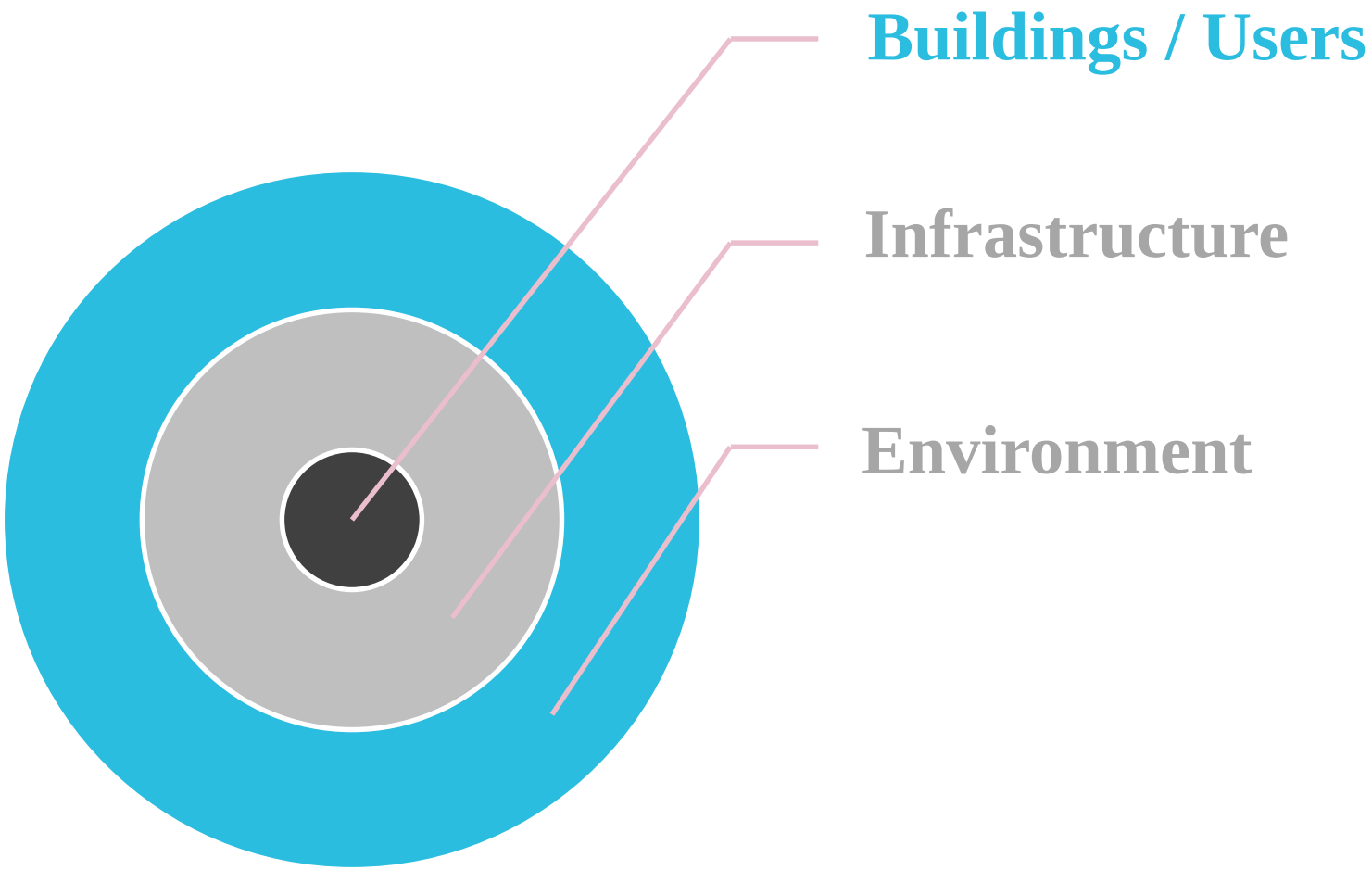
Water access

Too much water / Too little water

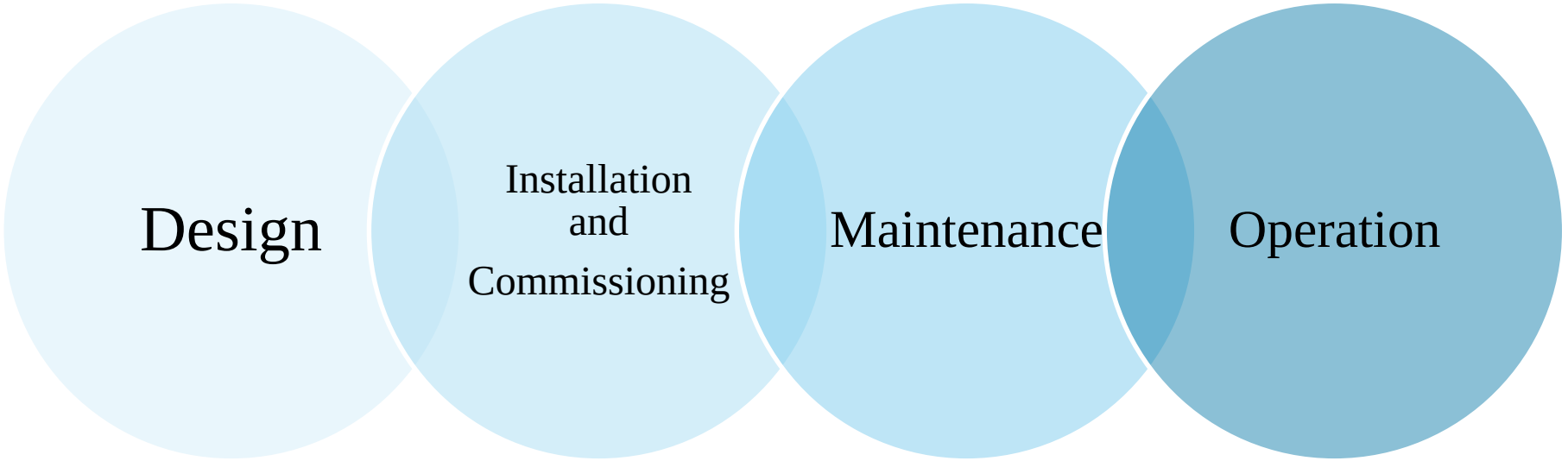
Climate Change and Water Adaptation

Demand and Performance

Urban Water Systems



The '*Chain of Responsibility*'



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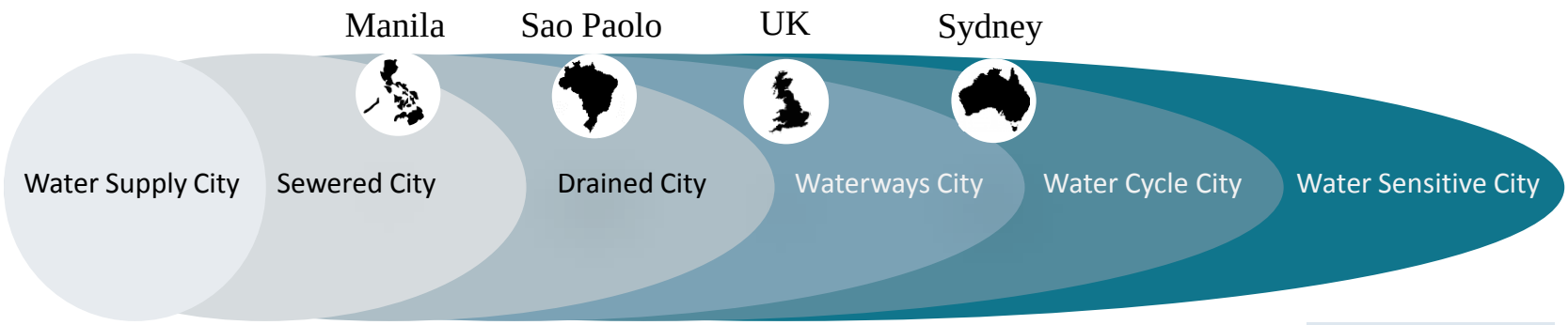
Progression of Urban Water Management Systems



Supply Hydraulics	Separate Sewerage Schemes	Drainage channelisation	Pollution & diffuse source pollution management	Diverse, fit-for-purpose sources & conversations, promoting waterway protection	Adaptive multifunctional infrastructure & urban design reinforcing water sensitive behaviour

Service delivery functions

Manila Sao Paolo UK

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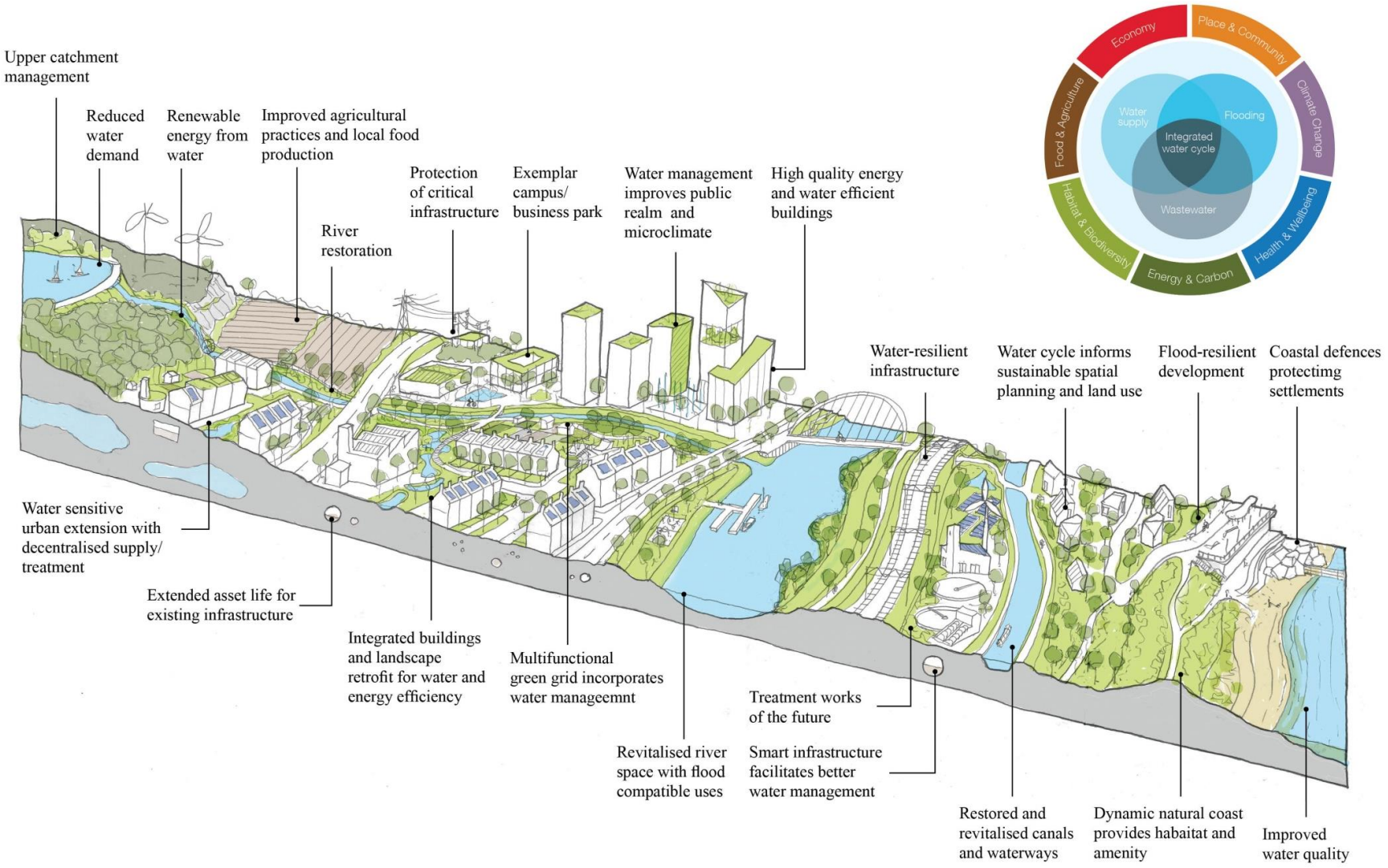
Context: Water at a catchment level



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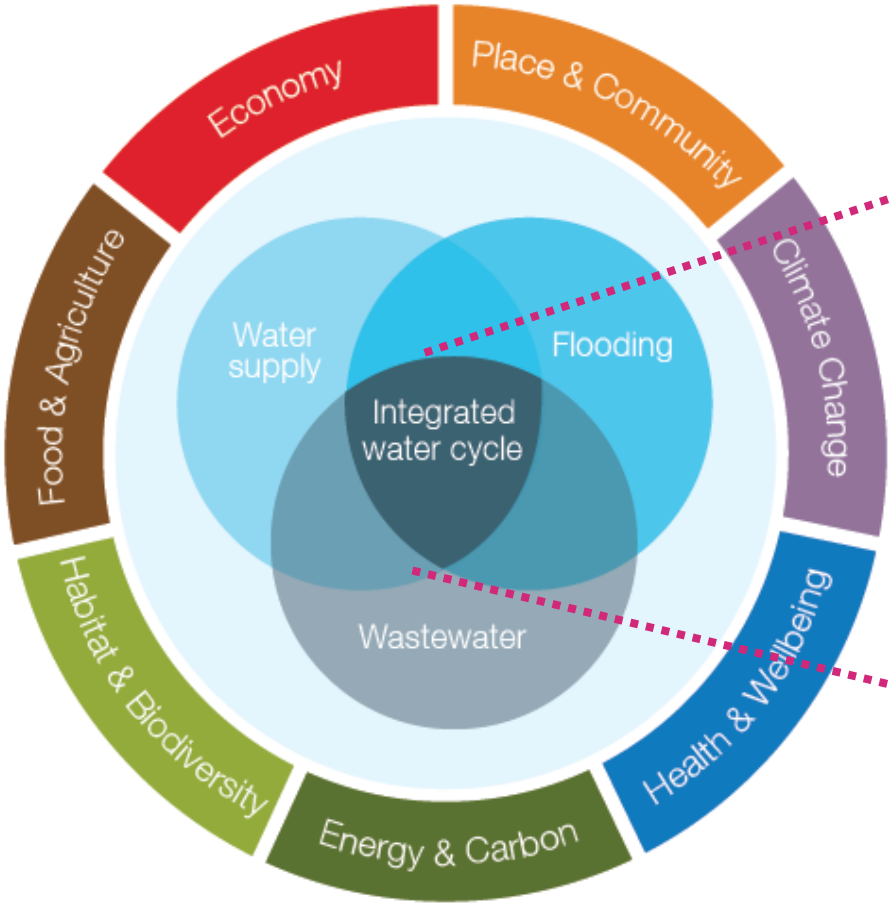
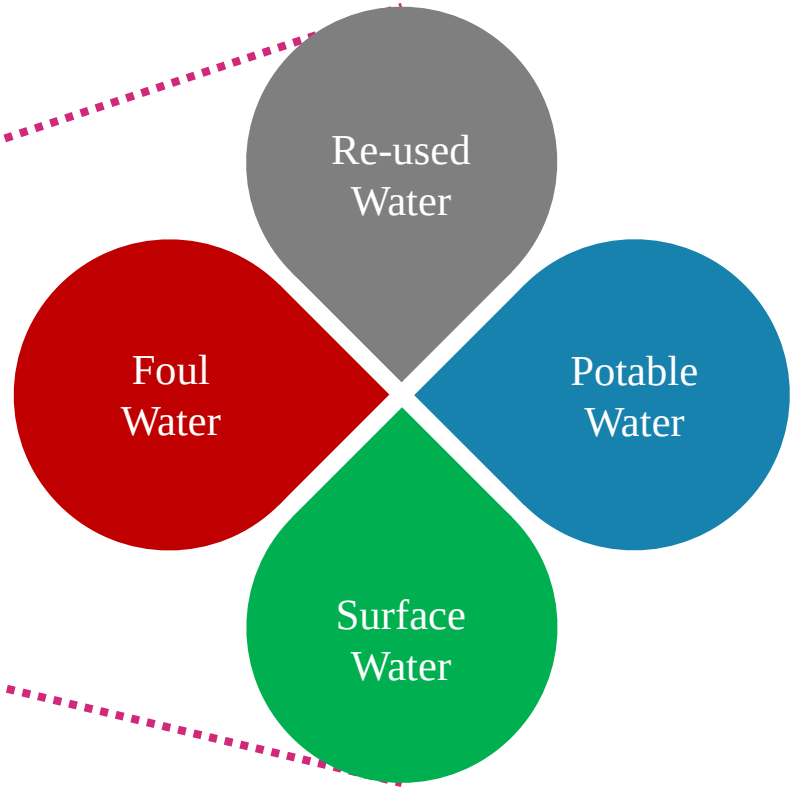
Integrated Water Management maximising the benefits

Urban Integrated Water Management





Integrated Water Management approach – outcomes

Optimised water solutions against objectives

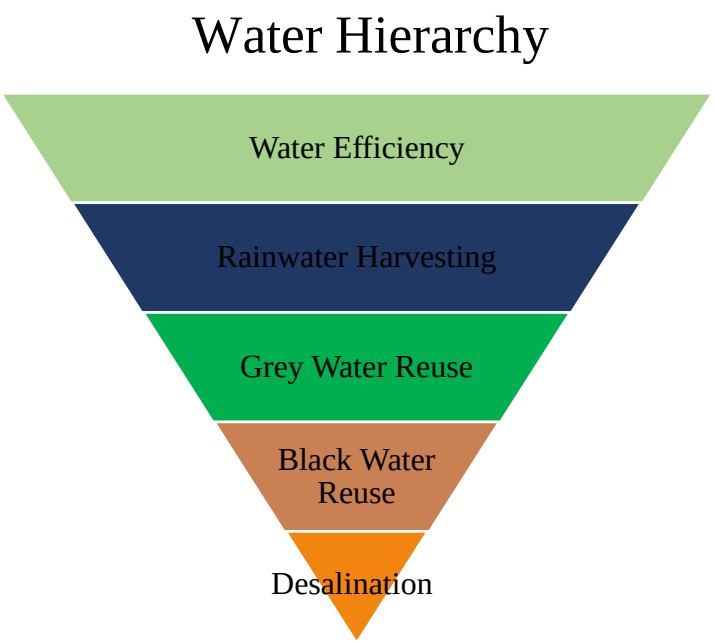
Lower impact development

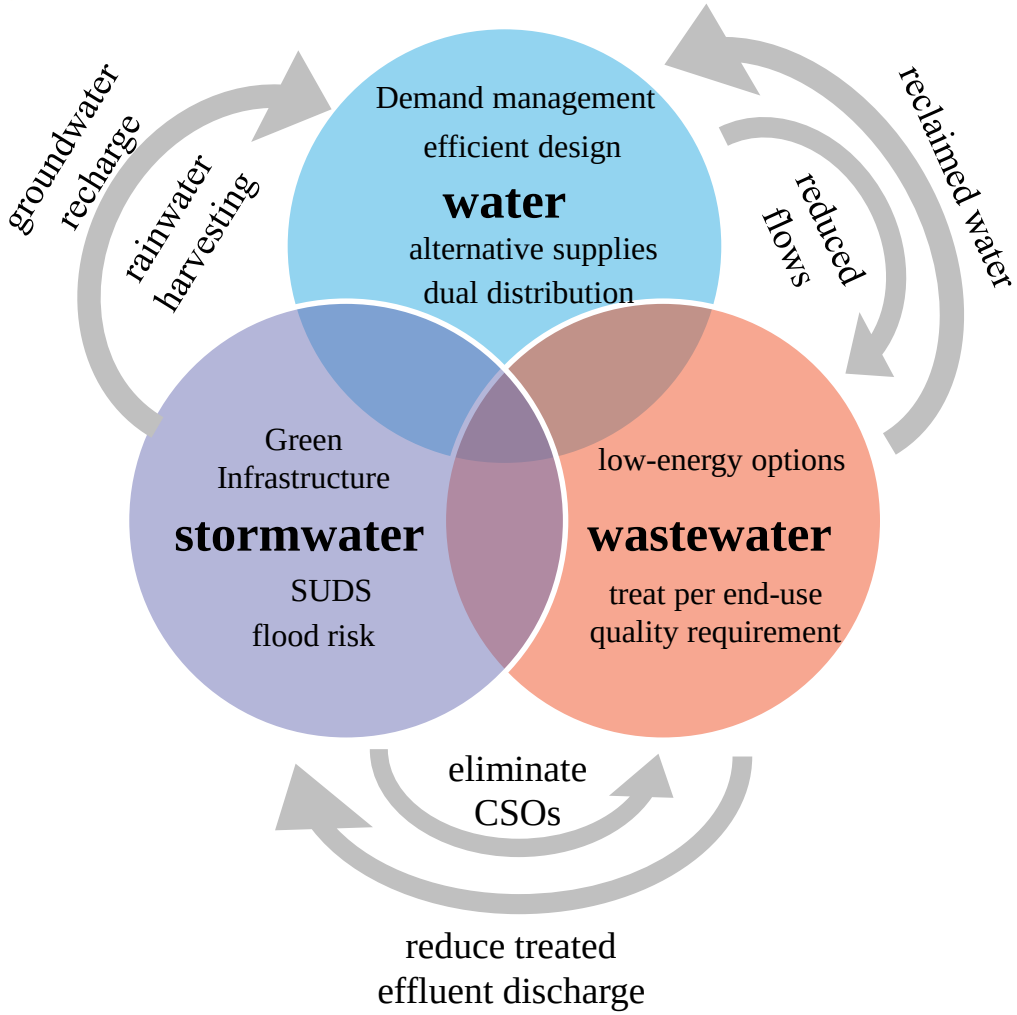
Green Infrastructure benefits

Minimisation of water infrastructure upgrade

Cost savings

Integrated Water Management and The Circular Economy





Project Pebble – Community involvement for IWM

Phase 1 – House

Specification and fit out of three retrofit homes

Three levels of water fit-out and awareness raising

ID and training of water champions

Phase 2 – Street

Water champions to engage their community

Options for fit-out + house & community level green infrastructure (rain gardens, green streets, urban realm)

Gamification and community competition

Phase 3 – City

Connecting the City

River initiatives

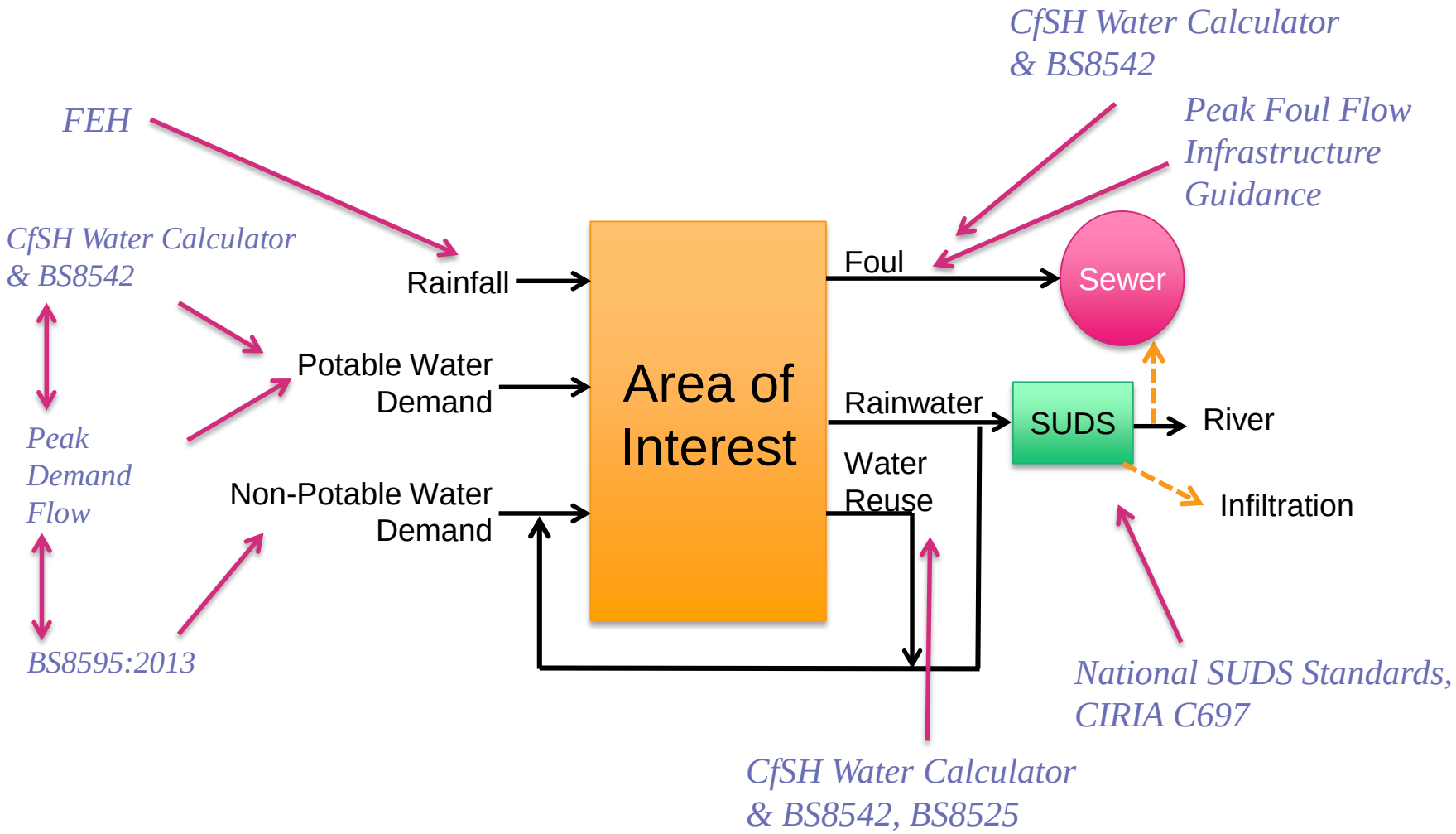
London development

Population growth

Ageing infrastructure

Infrastructure ‘*hot spots*’

Optimised approach to IWM



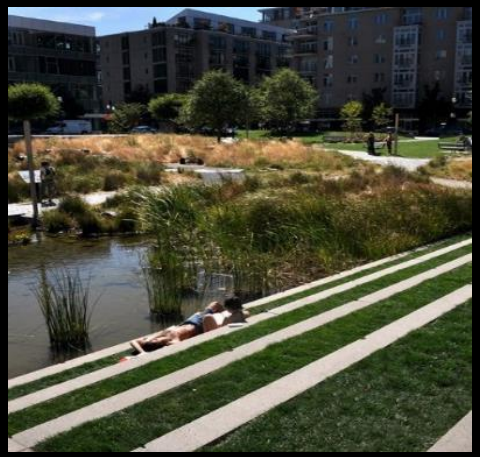
Flooding
/
Climate Change

Water Reuse

Rainwater
Harvesting

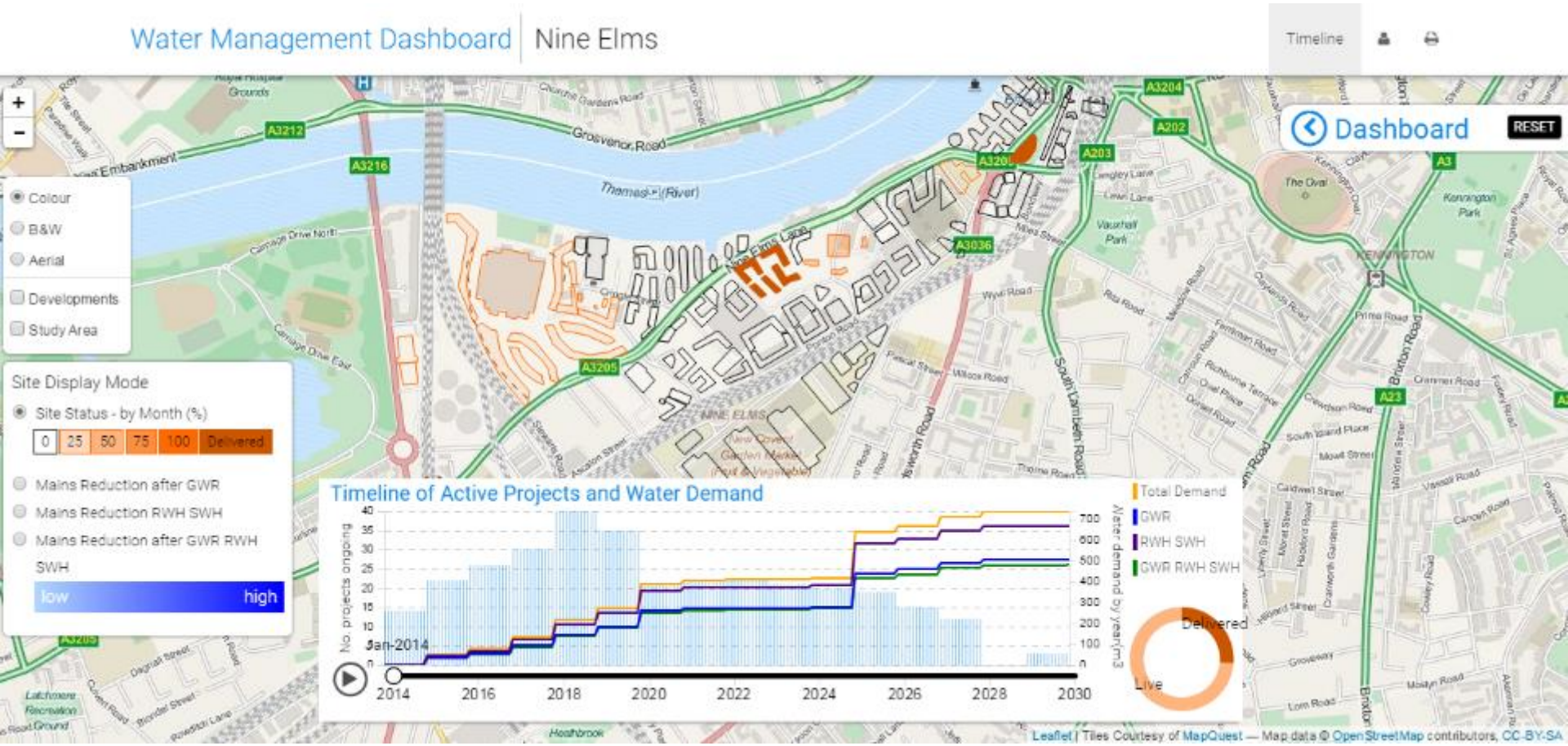
Water Scarcity
/
Droughts

Water Supply



SUDS
/
Urban Realm

Communication: sharing information



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Understanding Urban Water Systems

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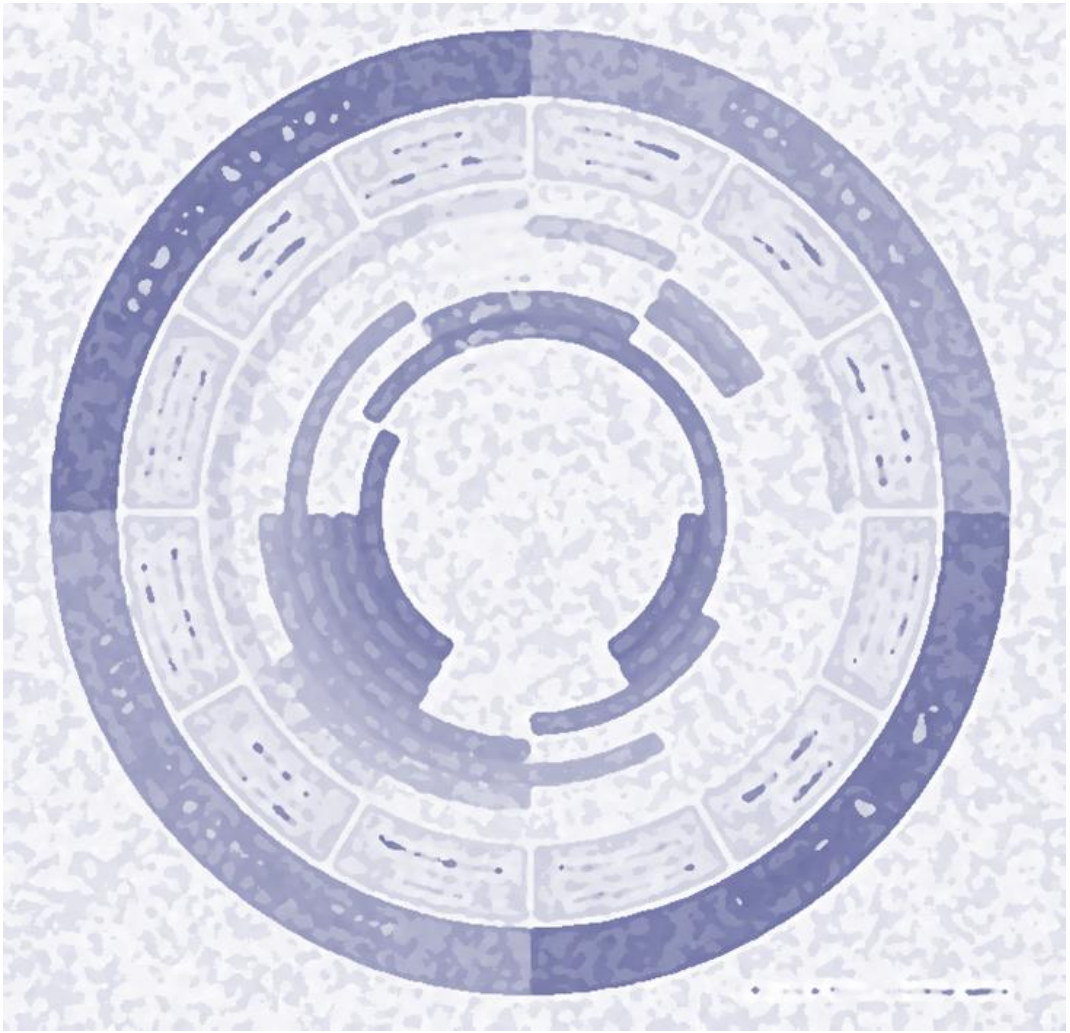
Understanding Urban Water Resilience



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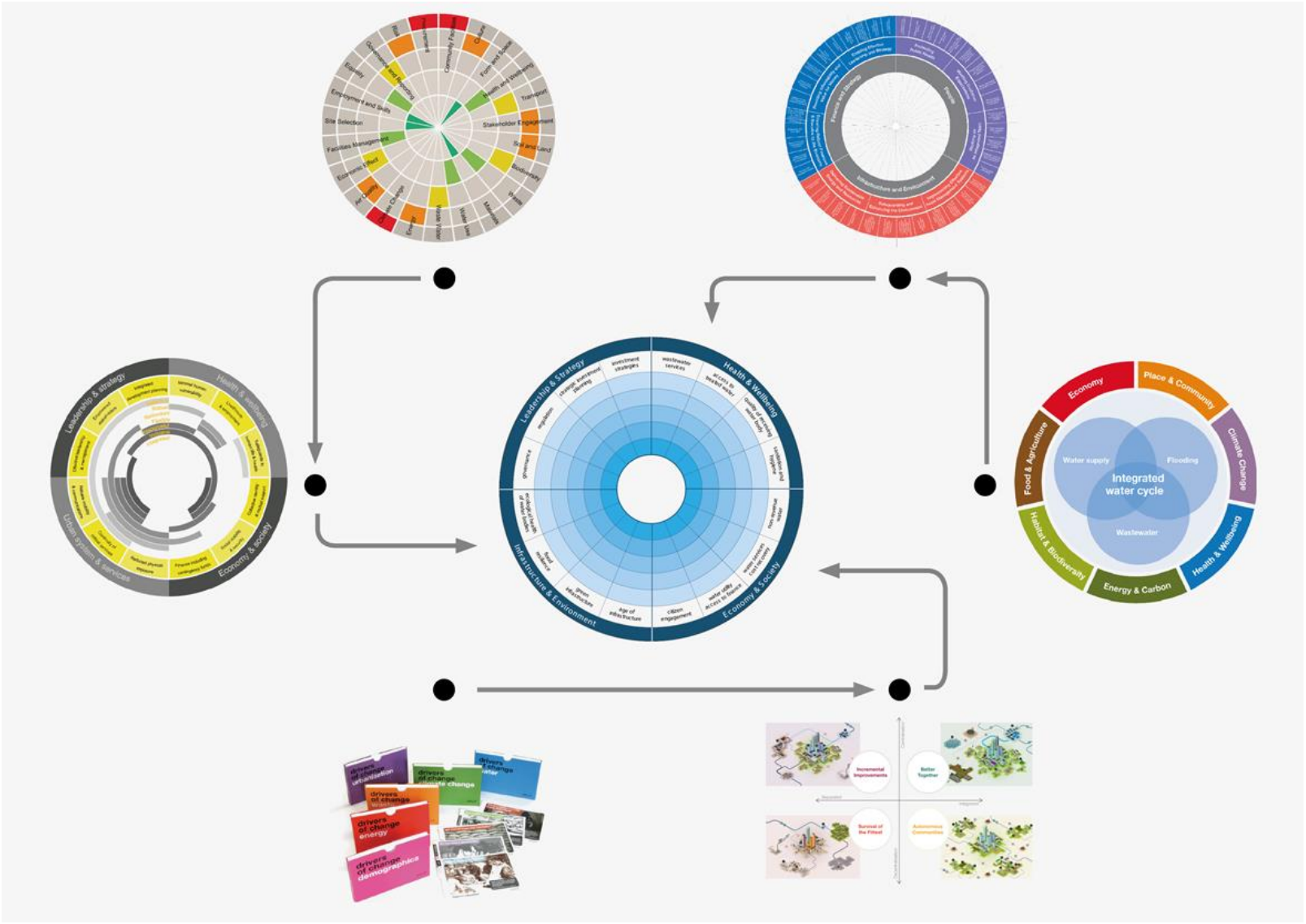
Developing a strategic view of water



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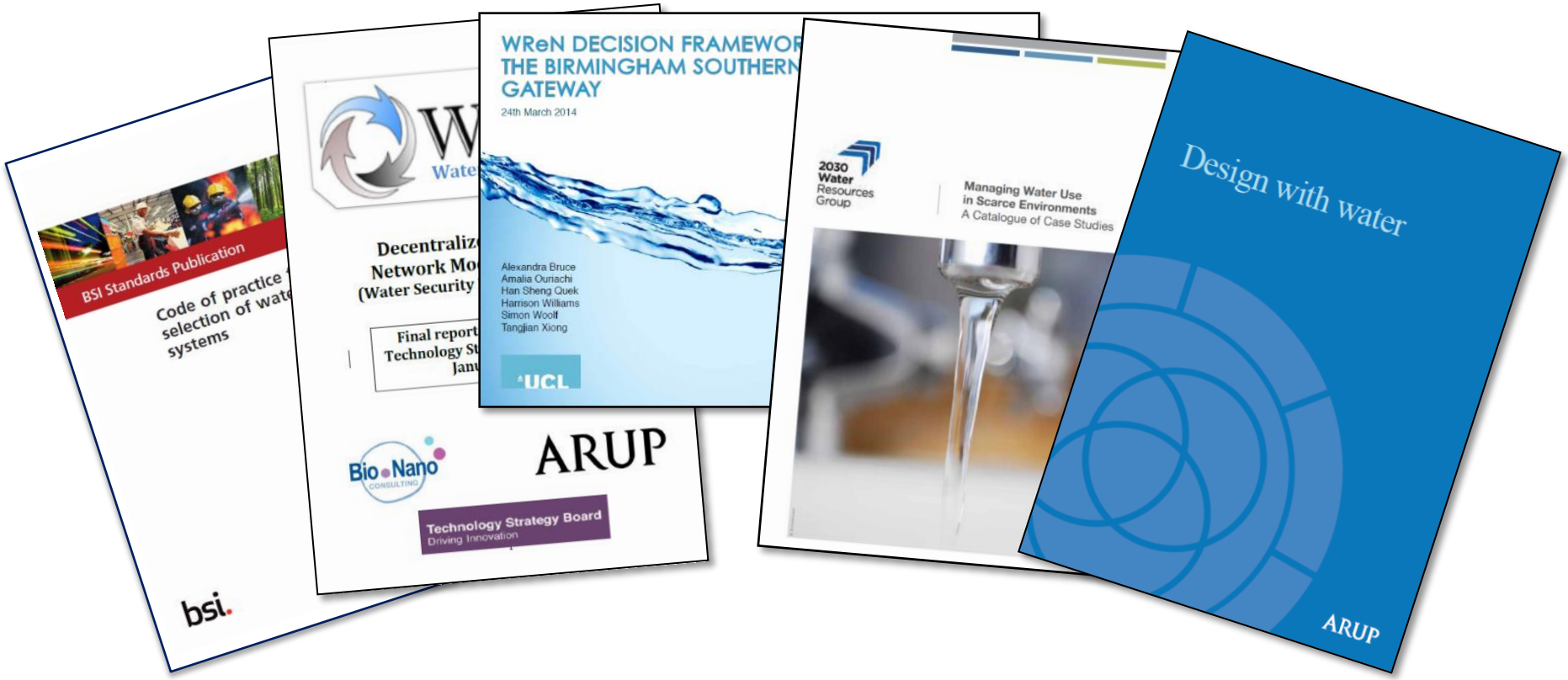
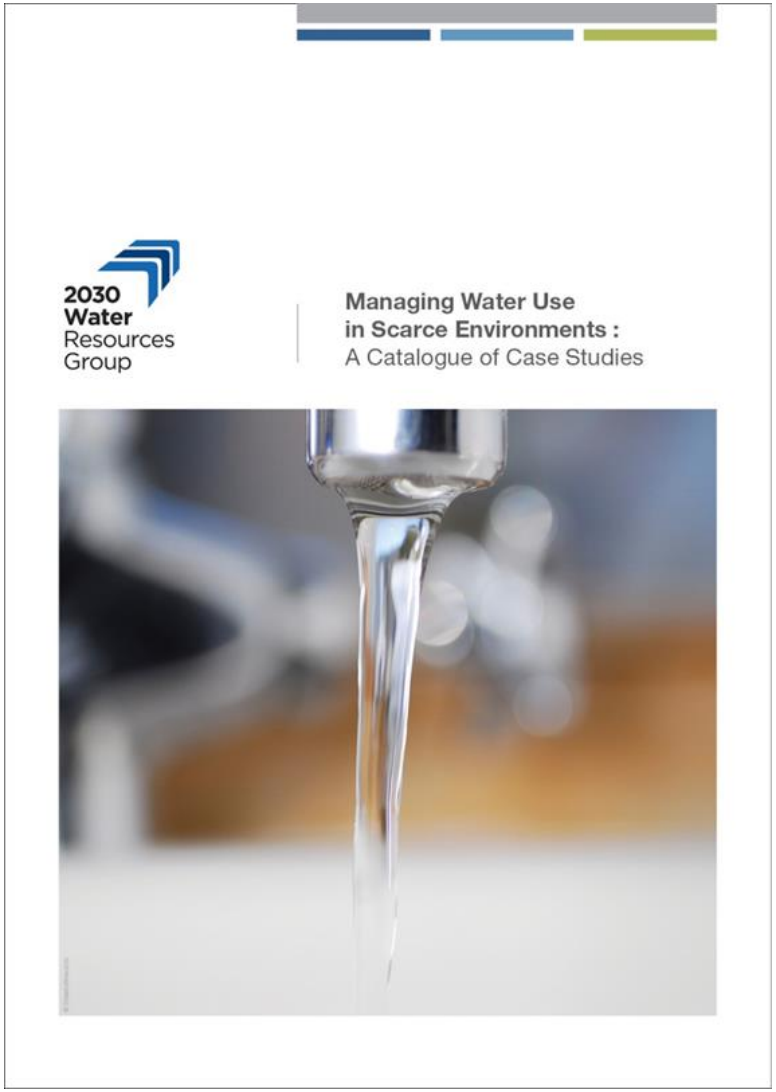
What is Arup doing?



Developing the evidence base for action



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Venturi - Accelerating innovation in the water sector

Needs

Solutions

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social

Singapore 'ABC Waters' Urban Waterway Regeneration Programme

environmental

'Living Machine' Bioremediation Wastewater Treatment System

environmental

"Sahara Forest Project" Saltwater Greenhouse Initiative

environmental

Barsha Hydro-powered Irrigation Pump

environmental

Multiuse Floating Pavilion Complex

environmental

Waterpebble Intelligent Water Meter

technological

WaterSmart Behaviour Change Utility Software

environmental

Cheonggyecheon Stream Restoration Project

technological

AVIVE Natural Water Treatment Process

technological

Atmospheric Water Generation Technology

environmental

Water Harvesting Fog Nets

environmental

Recyclebank Incentivised Sustainability Programme

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insights | themes | tags | + add insight | suggest insight | ☆ in my deck 0

EcoVolt Bioelectric Onsite Wastewater Treatment System

Tide Point Waterfront Renewal Project

Nowa Huta Sustainable City Concept

Los Angeles River Revitalization Masterplan

Concept

SWITCH Water Saving City Programme

Green Loops City Masterplan

Grand Canal Square Waterfront Revitalisation

CETO Wave Powered Desalination and Energy Generation System

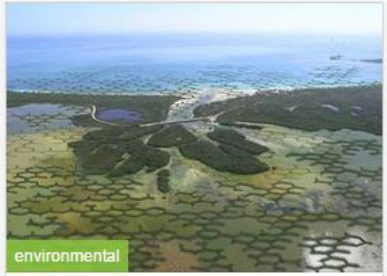
San Antonio River Walk Renewal Project

Kallang River Bishan Park Renaturalisation Project

Monitoring Programme

Synchronicity Island Human-powered Water Purifier Concept

"Jefferson Project" Lake Health Research Programme



Modular Mangroves Flood Mitigation Concept

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Digital Tide: Digital Disrupters
2050 Vision for the Water Sector

Digital Tide

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

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Arup Water Research Prospectus 2015-2017





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Water and Environment Services Engineering
Research Prospectus
2015 - 2017

Arup Water Research Prospectus 2015-2017

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Research Rationale

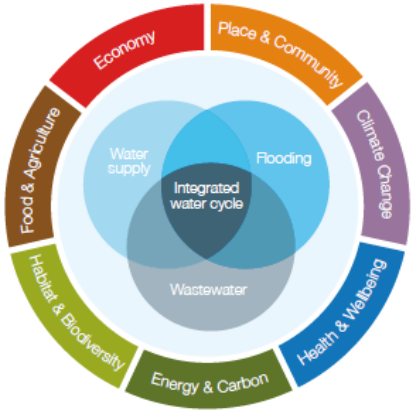
Access to water and sanitation is a fundamental human right. This has been recognised by the United Nations

Arup seeks to deliver research outputs comparable with world-class universities. I continue to be impressed and excited by the quality and innovation of our client and internal development projects. Research is a key contributor to Arup's success; we deliver new, validated thinking in support of our clients' projects and aspirations.

Where appropriate, Arup experts seek to work in collaboration with those organisations who have aligned interests

Arup is staff owned, this unique ownership structure means that we can invest our profits into Research and Development. Our staff are encouraged to work collaboratively with other organisations and universities with similar research interests.

Design with Water



Collaborative Working

Water touches all parts of lives and solutions other requires multi-partner working and collaboration. We see tremendous benefit from working with others with aligned outlook. Enriching our working and building new relationships.

195 external collaborators

£2.2m spent on research projects

327 ARUP contributors

Memorandums of understanding with 22 organisations.

5 years

More than 163 million people will benefit from the water projects ARUP worked on globally in 2012/13. Our goal is to increase this to 500 million over the next 10 years.

146 water research projects

1,250 people in our Global Water Skills Network

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Arup Water Research Prospectus 2015-2017

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Research themes

Working across our business we have identified four key themes for 2015 – 2017

Food Water Energy Nexus

The implications of farming for the water environment. Water utilities have not really grasped the debate around how much it is costing them to deal with the negative impacts of modern, heavily subsidised, agricultural and upland management practices. Phosphate and nitrate removal, colour and now metaldehyde (slug pellets) are some examples of how customers are paying again to indirectly support unsustainable agriculture. For example we could use WERMC developed in Hong Kong.

Partners: Water companies, government, universities, NFU, Defra

Future of Urban Water

Develop a framework for assessing future water resilience of cities across the UK.

Using methodologies developed in Australia (IUWMS, Carbon Footprint of Water Supply), Green Infrastructure and our water resilience cities approach at World Water Week in Stockholm.

Key Target UK cities include:

London, Birmingham, Bristol, Cardiff, Manchester, Liverpool, Glasgow, Newcastle upon Tyne, Hull, Leeds and Manchester.

Partners:

Water in and around Buildings

Developing design aids and better understanding building use to inform fundamental design criteria for hot and cold water systems. Placing buildings in a wider Integrated Water Management (IWM) approach for cities.

Water Resource Alternative for the South East

Develop a method of assessing alternative water supplies for the South East of England including:

Use of disused quarries in the Midlands to store excess river and groundwater for transfer into the Thames supply zone when required.

Alternative options including large scale wastewater re-use as done with NEW water in Singapore.

Partners: Severn Trent Water, Environment Agency, Water companies in the SE of England

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Arup Water Research Prospectus 2015-2017

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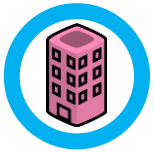
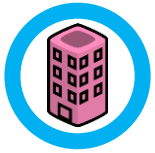


Water and Cities - understanding the social value of water

Complex Water Modelling - blockage guidance for hydraulic modelling & advanced techniques for water quality modelling

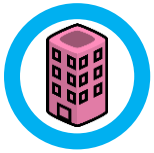
Flood Risk - Natural Flood management Design Guide



Asset Management - pumps and motors, predicting asset wear and failure

Circular economy – realising the value of wastewater – heat recovery and materials mining

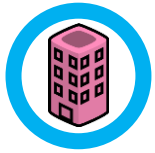
Decentralised Water - creating a new utility model, building on the Future of Urban Water project



Resilience/Advisory - operational Readiness in the Water Sector; research to transfer learning from airports to water.

BIM - Operationalising BIM. Development of a BIM matrix for water. Developing BIM for public health systems in Buildings

Dams & Reservoirs - application of Hazard Owl to the water sector; dams



Project Pebble – Engaging the community to develop a bottom up approach to integrating water in cities

Water systems in building – understanding the energy requirements for pumps, treatment, heating and disposing of water in buildings

Arup Water Research Prospectus 2015-2017

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Project Pebble – Engaging communities

Project Pebble is about taking a new, bottom up approach to achieving water efficiency, different to the usual top down approach. We will be working with a range of partners and water champions within that community to demonstrate the effect of this approach. Innovative elements such as social media and gamification will play a crucial role in help delivering change

Infrastructure Resilience – 'IRIs'

Developing new thinking to understand cascading failure within and between (interdependencies) infrastructure systems.

Water Innovation Portal

Working with the sector we aim to develop a web portal to connect industry needs with solutions

Research and innovation are part of the most important principles of Arup's ethos, in that it enable us to bring something special to what we do, wherever possible. We like to collaborate with others to bring new thinking forward to help our client to make a difference.

Contact

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How we can collaborate in the buildings / water space?

1. Data
2. Modelling
3. Simulation
4. Stimulating Innovation

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