



SINGAPORE INTERNATIONAL WATER WEEK 2026

THE GLOBAL PLATFORM TO SHARE AND CO-CREATE
INNOVATIVE WATER, COASTAL AND FLOOD SOLUTIONS



15 - 18 June 2026



Sands Expo & Convention Centre
Marina Bay Sands, Singapore

SIWW2026 WATER CONVENTION FINAL PROGRAMME

Version 1.0 – Accurate as of 2 June 2026

Water Convention is jointly organised by



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SIWW2026

PROGRAMME OVERVIEW

Key Pillars:

Municipal Water Solutions

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Coastal & Flood Resilience

|

Industrial Water Solutions

DATE	AM		PM		EVENING
15 June - Mon		Emerging Utility Leaders Summit <i>(by-invitation)</i> ●	Utilities CEO Roundtable <i>(by-invitation)</i> ●		
	Technical Site Visits ●●●				
	Water Convention (WC) Technical Sessions and Workshops ●●●				
16 June - Tue	SIWW2026 Opening ●●●	SIWW Keynotes ●●●	Titans of Industry ●●●	Water Leaders Summit ●	Industry Night ●●●
		VIP Expo Tour ●●●	WC Technical Sessions and Workshops ●●●		
		Partner Events ●●●			
	Water Expo <i>(in co-operation with IFAT)</i> ●●●				
17 June - Wed	Coastal and Flood Resilience Leaders Summit ●		TechXchange ●●●		Happy Hour ●●●
	Industrial Water Solutions Forum ●				
	WC Technical Sessions and Workshops ●●●		WC Poster Session ●●●	WC Technical Sessions and Workshops ●●●	
	Technical Site Visits ●●●				
	Partner Events ●●●		Partner Events ●●●		
	Water Expo <i>(in co-operation with IFAT)</i> ●●●				
18 June - Thu	Emerging Utility Leaders Summit <i>(by-invitation)</i> ●				
	Industrial Water Solutions Forum ●				
	WC Technical Sessions and Workshops ●●●			WC Closing ●●●	
	Technical Site Visits ●●●				
	Partner Events ●●●		Partner Events ●●●		
	Water Expo <i>(in co-operation with IFAT)</i> ●●●				

PROGRAMME COMMITTEE CO-CHAIRS



Bernard Koh

Assistant Chief Executive
(Future Systems and Technology)
PUB, Singapore's National Water Agency



Darryl Day

Principal and Director
Wongulla Waters

On behalf of the Programme Committee, we invite you to join us at the Water Convention, a key flagship programme of the Singapore International Water Week (SIWW) 2026, taking place from 15 to 18 June 2026.

As one of the leading global water events focused on innovation and solutions, SIWW2026 will once again play host to global leaders, experts and practitioners from governments, cities, water utilities, agencies, industry and academia. The event provides a platform to exchange knowledge and best practices on innovative municipal and industrial water, coastal and flood solutions, and foster partnerships to tackle urban water and associated climate challenges.

Co-organised by PUB, Singapore's National Water Agency, and the International Water Association, the 2026 Water Convention will present papers on the latest innovation, technologies, best practices and case studies in six themes covering the urban water cycle. These themes reflect the urgent issues and challenges facing urban water practitioners, such as ensuring the sustainable production and supply of safe and clean drinking water, the effective and efficient collection and treatment of used water, improving efficiencies of existing processes and exploring linkages between domestic and industrial applications, resiliency and adaptability of urban cities to climate change, floods and sea-level rise, applying the One Water-One Health approach, and resource efficiency and circular economy for the water sector.

Delegates can look forward to a high-quality technical programme at the Water Convention. Highlights include the SIWW keynotes session with 4 keynote presentations and the 2026 Lee Kuan Yew Water Prize Lecture, 40 technical sessions featuring over 165 expert speakers, a poster session with more than 170 posters and 24 workshops covering topics such as water treatment, digital transformation of utilities, climate resilience and flood management, nature-based solutions, water and health integration, circular economy and resource recovery, sanitation and infrastructure investment and industrial applications.

It is our wish that the sessions presented at this Water Convention will inspire collaboration across the global water community and contribute towards meaningful action to build a sustainable and resilient global water future for all.

We look forward to meeting you in Singapore at the SIWW2026 Water Convention.

SIWW2026 WATER CONVENTION

PROGRAMME COMMITTEE

CO-CHAIRS

Bernard Koh Assistant Chief Executive (Future Systems and Technology) PUB, Singapore’s National Water Agency	Darryl Day Director and Principal Consultant Wongulla Waters
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THEME 1: WATER NETWORK

THEME LEADER Amir Cahn Chief Executive Officer Smart Water Networks Forum (SWAN)	MEMBERS Albert Cho Senior Vice President and Chief Strategy and External Affairs Officer Xylem Kah Cheong Lai Senior Deputy Director PUB, Singapore’s National Water Agency Tertius Rust Founder and Executive Director The Innovation Consulting Company	Enrique Cabrera Professor of Fluid Mechanics Universitat Politècnica de València Martine Watson Chief Digital and Information Officer Urban Utilities Zdravka Do Quang Group Innovation Programs Officer SUEZ
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THEME 2: WATER TREATMENT

THEME LEADER Jonathan Clement Global Director JAC Water	MEMBERS Bob Stear Chief Engineer Severn Trent Michael Storey Director of Innovation SUEZ Australia & New Zealand Min Yang Deputy Director Research Center for Eco-Environmental Sciences	Key Wee Ong Chief Specialist, Potable Water Treatment PUB, Singapore’s National Water Agency Nikolay Voutchkov Founder and the Director General Water Globe Consultants
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THEME 3. USED WATER MANAGEMENT, REUSE AND INDUSTRIAL WATER SOLUTIONS

THEME LEADER Kartik Chandran Professor of Earth & Environmental Engineering Columbia University	MEMBERS Andrew Robert Shaw Associate Vice President, Global Practice and Technology Leader Black & Veatch Guihe Tao Chief Specialist, Used Water Treatment PUB, Singapore’s National Water Agency Mads Leth Chief Executive Officer VCS Denmark Norhayati binti Abdullah Associate Professor Tokyo City University	Govind Alagappan President Gradient Jay Bhagwan Executive Manager, Water Use and Waste Management Water Research Commission Mark van Loosdrecht Professor Delft University of Technology Susan Moisio Senior Vice President and Global Water Market Director Jacobs
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THEME 4: CLIMATE RESILIENT CITIES, FLOOD MANAGEMENT AND COASTAL PROTECTION

THEME LEADER

Mark Fletcher
Director
Arup

MEMBERS

Chai Teck Ho
Deputy Director, Coastal Protection Department
PUB, Singapore's National Water Agency

Christian Nyerup Nielsen
Director Water Climate Adaptation, Water
Ramboll

Scott Dunn
Chief Strategy Officer, Asia
AECOM

Thomas Pang
Senior Assistant Director, Catchment &
Waterways Department
PUB, Singapore's National Water Agency

Tomoya Shibayama
Institute Professor at Research and
Development Initiative
Chuo University

Tony Wong
Distinguished Professor of Sustainable
Development
Monash University

THEME 5: WATER QUALITY AND ONE HEALTH

THEME LEADER

Robert Bos
Independent Consultant
Public Health, Environment,
Water and Sanitation

MEMBERS

Chee Meng Pang
Director, Water Quality Department
PUB, Singapore's National Water Agency

David Cunliffe
Principal Water Quality Advisor
SA Health

Fiona Waller
Independent Consultant

Regina Sommer
Head of Unit Water Hygiene and
Co-Head ICC Water & Health
Medical University of Vienna

Ruchika Shiva
Director - South Asia Regional Programme
IRC International Water and Sanitation Centre
(IRCWASH)

THEME 6: NEXUS & RESOURCE CIRCULARITY

THEME LEADER

Dragan Savic
Global Advisor,
Digital Sciences
KWR Water Research Institute

MEMBERS

Adam Lovell
Executive Director
Water Services Association of Australia

Despo Fatta-Kassinou
Professor
University of Cyprus

Gurdev Singh
Chief Engineering & Technology Officer
PUB, Singapore's National Water Agency

Heather Smith
Senior Lecturer in Water Governance
Cranfield University

Lucy Thomas
RSK Group Board Director, Chief Scientist and
Regional Operations, Africa
RSK Group

Wilbert Menkveld
Chief Technology Officer
Nijhuis Saur Industries

THEME

1

WATER NETWORK

The water industry is undergoing a transformative evolution as utilities embrace innovative approaches to address growing climate, data management, workforce, and customer service challenges. AI-driven solutions can provide predictive insights while workforce development has taken center stage, with continuity planning and new business models fostering innovation and digital transformation. These advancements enable more efficient operations and customer engagement; however, successful implementation requires balancing technological advancement with human-centered approaches that ensure solutions are embraced by both operators and consumers. This theme explores the latest innovations, best practices, and case studies in creating sustainable water networks that address both technical and social dimensions of modern water management.

THEME

2

WATER TREATMENT

Cities worldwide face the challenge of limited freshwater supply, prompting them to diversify their water sources to become more resilient. As treatment technologies continue to advance, there is an increasing focus on making the process more sustainable by reducing energy requirements, exploring beneficial reuse of brine, and harvesting energy from waste streams. Additionally, these technologies have to be adaptable to the future impacts of climate change, for instance by designing treatment processes that can cope with changing water quality. While ensuring a sufficient and sustainable water supply is critical, it is equally important to ensure that the water supplied is of the highest possible quality. To this end, water utilities are applying advanced technologies that can effectively treat and remove contaminants of emerging concern and specific groups of contaminants that are resistant to conventional processes. Water utilities are also exploring the use of innovative sensors and digital solutions to support them in plant operations, maintenance, and optimisation.

THEME

3

USED WATER MANAGEMENT, REUSE AND INDUSTRIAL WATER SOLUTIONS

- A. TREATMENT
- B. REUSE
- C. INDUSTRIAL APPLICATIONS

In our pursuit of a sustainable future, the perception of wastewater has changed from being something unwanted to a beneficial resource. This shift drives the desire to extract as much water, energy, and valuable materials from wastewater as possible. A growing number of technologies have been developed to enhance energy generation during treatment and reuse of both domestic and industrial wastewater (or alternatively, ‘used water’) streams. Meanwhile, to mitigate climate change, attempts are made to reduce the overall carbon footprint of wastewater management including nitrous oxide and methane emissions. There is an upward trend in recovering and reusing material resources from waste streams, including for industrial and commercial applications. For the remaining wastewater effluent, a high quality is targeted for reuse applications, potentially in part through the use of membrane technologies and processes. Besides looking into new innovations, efforts are also placed in improving the efficiencies of existing processes and explore linkages between domestic and industrial applications to enhance overall system sustainability. This theme welcomes abstracts examining best practices and innovative technologies for sustainable and economically viable centralised or decentralised treatment, reuse and management of domestic and industrial wastewater and the resources embedded therein.

D. CONVEYANCE

Sewers are vital for the sanitary conveyance of wastewater to treatment facilities. To ensure that sewers can carry out their function well, proper operation and maintenance are necessary. Utilities are taking a more proactive approach in these areas with the help of digitalisation and intelligent technologies. In sewer operation, analytics and management tools are employed with real-time sensors and meters for detecting and predicting blockages, inflows, and infiltrations. It is equally important to examine the quality of the wastewater discharged into sewers as it affects downstream treatment processes. In maintenance, advanced inspection equipment is deployed for sewer inspection, cleaning, and rehabilitation. The necessity for cutting-edge technologies becomes more apparent as large sewers are laid more deeply in the increasingly urbanised cities. Such deep tunnel sewage systems require innovative solutions for monitoring the tunnel’s structural integrity and conveyance condition.

Climate Resilient Cities

Cities comprise interconnected systems - transport, water, planning energy and more. Over time, these systems have developed and significantly altered our natural environment, especially the water cycle. Climate Change is now affecting this already-modified natural system, causing more frequent and extreme impacts through shocks (short-duration) and stresses (longer-term) events. Increasingly, we will need to deal with 'too much water' from pluvial (stormwater), fluvial (riverine), tidal/coastal and groundwater flooding in certain seasons. At the same time, we must grapple with 'too little water', such as drought and water stress in other seasons. In addition, climate driven impacts such as coastal flooding and saline intrusion are also compromising water quality. Building resilience to these complex water-related impacts therefore requires a deep understanding of the dependencies and inter-dependencies between these systems. It is therefore extremely important that cities adapt quickly in the face of changing climate and develop strategies that can operate effectively to deal with the deep uncertainties that come along with it.

Flood Management and Coast Protection

We must adapt to changing boundary conditions such as sea level rise, groundwater fluctuations or changes in river flow as well as changing rainfall intensity. To minimise the damage arising from potential floods, we need to invest in a myriad of measures and infrastructure in response to changing environmental challenges. These efforts can be supported by implementing flood warning systems, evacuation planning, and best practice guidelines, such as relocating high-value or vulnerable assets beyond the impact, enhancing resilience to properties or adopting contingency measures to reduce risk. Upstream storage and soaking up or slowing down overland flow are possible strategies to help attenuate flooding. Similarly, off-line storage, aquifer storage and recovery, water demand reduction, conservation measures and land-use changes can help preserve water resources and improve water security.

The Role of Nature

There is an increasing trend in working closely with natural processes for building resilience against climate change. The growing interest in implementing nature-based or hybrid solutions is a compelling indication that more research and understanding in the role of nature in our adaptation efforts are required. When applied under the right conditions, nature-based solutions such as mangroves would be effective as coastal protection measures. It is becoming increasingly important to recognise and value the environmental and social benefits that nature provides as part of a holistic resilience strategy.

Water professionals and practitioners continue to face challenges at all levels, from the impact of extreme weather events on infrastructure to a growing imbalance between water scarcity and expanding populations, and threats related to emerging pollutants, spreading anti-microbial resistance and distribution system associated pathogens such as Legionella. The Report of the Global Commission on the Economics of Water (October 2024) places the hydrological cycle at the centre of current thinking about the ways humanity can optimize its management of the planet's water resources and arrive at innovative solutions that address the impending water crisis. By valuing the hydrological cycle as a global common good, a new framework is created to address climate change, biodiversity loss, water quality and scarcity, and basic human needs in a One Water approach. That framework also acknowledges planetary health, human, animal and environmental health (One Health) and community health as a continuum. The associated entry points are reflected in the seven broad topic areas that follow, which make up the scope of Theme 5. Assessing and managing water quality in the planning, design and delivery of water and sanitation services and of wastewater management require ever more sophisticated methods of on-line detection, monitoring and surveillance where research results can be easily transformed into practical and cost-effective applications for evidence strengthening and regulation. Increasingly, they will have to deal with established and emerging chemical pollutants and microbial contaminants using the rapidly evolving AI opportunities.

Advancing Circular Water Systems – From Innovation to Implementation

The water sector has made significant strides in adopting circular economy principles, moving beyond closing the water loop through advanced treatment to integrating resource recovery, decarbonization, and systemic resilience. Achieving this requires a holistic approach that bridges technology, governance, ecology, and socio-economic enablers. This theme covers sustainable frameworks, strategies, and case studies that address six critical pillars of circular water systems:

- 1. Governance, Policy, and Stakeholder Collaboration**

Policy design, participatory planning, and multi-actor engagement to legitimize, incentivize and scale circular solutions.

- 2. Technology, Innovation, and Digitalization**

Cutting-edge treatment, resource recovery, and smart water management to optimize circular loops.

- 3. Nature-Based Solutions and Ecological Regeneration**

Harnessing ecosystems for water resilience and valuing natural capital in circular designs.

- 4. Decarbonization and Energy Efficiency**

Integrating low-carbon technologies, carbon capture, and energy-neutrality in circular water systems.

- 5. Risk and Regulatory Challenges**

Mitigating contaminants, harmonizing regulations and standards, and safeguarding public health in circular transitions.

- 6. Enablers: Finance, Education, and Business Models**

Innovative financing, workforce development, and scalable business cases for circular water.

SIWW2026 WATER CONVENTION

PROGRAMME OVERVIEW

TS: Technical Session											WS: Workshop		
		Theme 1	Theme 2	Theme 3		Theme 4		Theme 5		Theme 6			
15 June - Mon	9:00AM – 10:30AM	TS1.1 Seeing the Invisible: Next Generation Leak Detection at Scale	TS2.1 Advancement in Membrane Technology	TS3.1 Treatment of Contaminants of Emerging Concerns		TS4.1 Climate Resilient Water Systems Planning		TS5.1 One Health Approaches to Water Quality and Faecal Source Tracking		WS6.1 Advancing Nitrous Oxide (N ₂ O) Monitoring: Global Protocols, Collaboration, and Pathways to Sector-Wide Action: Case Studies & Panel			
	11:00AM – 12:30PM	WS1.1 Adapting South Asia's Water Systems in a Digital Age	TS2.2 Brine Valorization	TS3.2 Nature-based Treatment		WS4.1 Economics for Climate-Resilient Water Investments		WS5.1 Rethinking Water and Health: Integrating One Water and One Health					
	2:00PM – 3:30PM				TS3.3 Industrial Wastewater Treatment		TS4.2 Innovations in Coastal Resilience		WS5.2 Options and opportunities to develop the next generation of (bio)sensors for chemical pollutants and microbiological contaminants in drinking water and wastewater		TS6.1 Resource Recovery (1)		
	4:00PM – 5:30PM					TS4.3 Urban Flood Resilience: Strategies and Tools		TS6.2 Resource Recovery (2)					
16 June - Tue	9:00AM – 1:00PM	SIWW Opening & Keynotes											
	2:00PM – 3:30PM	TS1.2 From Reactive to Proactive: Securing Water Operations in a Digital Age	WS2.1 Ceramic membranes for Pre-treatment of Seawater Desalination	TS3.4 Management of Greenhouse Gases		TS4.4 Polder Cities in Focus: Resilient Urban Flood Management Worldwide		TS5.2 From Prediction to Prevention: Managing the Quality of Drinking Water Sources		TS6.3 Nature-based Solutions			
	4:00PM – 5:30PM	TS1.3 Keeping Water Safe in Distribution Networks		TS3.5 Process Integration & Intensification		WS4.2 Adaptation Pathway Building Session Responding To Fluvial Flood Risk In Southeast Asia		WS5.3 Practical lessons learned from peer-to-peer Water Cycle Partnerships, around the world (Lao PDR, Jordan, Kenya	WS5.4 Safeguarding Surface Waters: Tackling Harmful Algal Blooms and Taste & Odor Challenges	WS6.2 Net zero for water utilities: Has momentum stalled – and how do we accelerate?			
17 June - Wed	9:00AM – 10:30AM	TS1.4 People in Change: The Missing Middle of Smart Water	WS2.2 Overcoming the Social, Technical and Institutional Barriers to Direct Potable Reuse	WS3.1 Sustainable Global Biosolids Management Strategies	TS3.6 Management of Sewer Network			WS5.5 Our Next 10 years' Integrated Framework for Micro- and Nano plastic Surveillance and Health Relevant Assessment		TS6.4 Policy & Planning for Circularity	WS6.5 Data Centers: Strategies And Opportunities For The Water Sector		
	11:00AM – 12:30PM	TS1.5 Mirroring Worlds: The Rise of Digital Twins			TS3.7 Reuse			TS5.3 Integrating Machine Learning, Sensors, and Biomolecular Indicators for Water Quality Assessment					
	2:00PM – 3:30PM	Water Convention Poster Session											
	4:00PM – 5:30PM	TS1.6 Walking through the Digital Door to AI-doption	WS2.3 Incorporating Nature Based Water Treatment Solutions	TS3.8 Advancements in Nutrient Removal	TS3.9 Data Center Water Solutions	TS4.5 Advanced Flood and Coastal Forecasting for Climate Resilience		WS5.7 Wastewater and Environmental Surveillance for new pathogens		TS6.6 Stakeholder Engagement	TS6.5 Circularity Frameworks		
	18 June - Thu	9:00AM – 10:30AM	WS1.2 SWAN APAC Workshop: Transforming Digital Water for Shared Progress	TS2.3 Treatment for Micropollutants		TS3.10 Advancements in Thermal Treatment of Biosolids		WS4.3 Integrated Flood Resilience for High-Density Coastal Cities	WS4.4 Nature Based Solutions for Resilient Water Systems in Asia Pacific – maximizing infrastructure investment value.		TS5.4 Resilient and Sustainable Water and Sanitation Solutions for Public Health Protection		WS6.3 Expanding Circularity and Nexus in Water: What are the Leverage Points for Systems Change?
11:00AM – 12:30PM		TS2.4 Low Energy Desalination		TS3.11 Advancements in Biosolids Management		TS5.8 Investing in Climate Resilient Sanitation: Costs, Finance and Priorities for Action			WS6.4 Cross Sector Collaboration to Accelerate the Circular Water Economy				
2:00PM – 3:30PM		TS2.5 Advancements in Reverse Osmosis		WS 3.2 Nanobubbles: A New Frontier in Treatment Performance	TS3.12 Advanced Control and Machine Learning	TS4.6 Technology-Enabled Nature-Based Solutions for Coastal Protection		TS5.5 Emerging Contaminants in Water Systems: Occurrence, Assessment, and Risk Management					
4:00PM – 5:30PM		Water Convention Closing Plenary											

SIWW KEYNOTES

Join us at the SIWW Keynotes on 16 June 2026, Tuesday where scientific and industry thought leaders will deliver keynote presentations addressing critical urban water and climate challenges to build a more resilient and sustainable water future. This includes the lecture by the 2026 Lee Kuan Yew Water Prize winner.

16 June 2026 (Tuesday) | 11:30AM – 12:55PM | L5, Sands Grand ballroom

Time	Programme
11:30AM – 12:00PM	2026 Lee Kuan Yew Water Prize Lecture Prof Joan Rose Homer Nowlin Chair in Water Research, Michigan State University (United States) Moderator: Professor Low Teck Seng, Chair of the LKYWP Nominating Committee (Singapore)
12:00PM – 12:05PM	Welcome Remarks by Water Convention Co-Chairs Bernard Koh and Darryl Day
12:05PM – 12:10PM	Welcome Remarks by President, International Water Association Hamanth Kasan
12:10PM – 12:25PM	Keynote 1: Investing in Water Resilience: Turning Climate Science into Climate Security Dr Winston Chow Lee Kong Chian Professor of Urban Climate, SMU College of Integrative Studies; Pillar Lead (Urban Systems), SMU Urban Institute, Singapore Management University; Co-Chair, Working Group II of the Intergovernmental Panel on Climate Change's (IPCC) (Singapore)
12:25PM – 12:40PM	Keynote 2: Digital Water: AI, Autonomy, and Why Humans Still Matter? Prof Dragan Savic Global Advisor Digital Sciences, KWR Water Research Institute (Netherlands)
12:40PM – 12:55PM	Keynote 3: Transformation of the Water Industry in Malaysia YBhg. Dato' Seri Ir. Jaseni Maidinsa Chairman, Pengurusan Aset Air Berhad (Malaysia)
12:55PM – 1:05PM	SIWW2026 Water Convention – Trends and Analysis of Abstracts Lovejit Singh Saka Consultant, BlueTech Research (India)



POSTER SESSION & CLOSING PLENARY

POSTER SESSION

17 June 2026 (Wednesday) | 2:00PM – 3:30PM | L4 Corridor

Poster Session provides a platform for researchers and practitioners to showcase innovative studies, technologies, and case applications from across the water sector. During the session, poster presenters will be stationed alongside their posters to share insights, discuss their work with delegates, and respond to questions. The session also offers an opportunity for both judges and attendees to engage with the presenters and learn more about emerging ideas and solutions shaping the water industry.

Click [here](#) to view the list of poster presentations



CLOSING PLENARY

18 June 2026 (Thursday) | 4:00PM – 4:30PM | Room 5 & 6

The Closing Plenary wraps up the week's discussions by highlighting key insights and themes from across the programme. The session reflects on the major takeaways shaping the global water agenda and concludes with the presentation of the Best Poster Awards, recognising outstanding Poster presenters.



WATER CONVENTION

WORKSHOPS

Workshops at SIWW2026 Water Convention provide an interactive platform for experts, practitioners, and industry leaders to explore emerging issues and practical solutions across the urban water cycle. Curated in collaboration with the Programme Committee and partnering organisations, these sessions bring together diverse perspectives through presentations, moderated discussions, and audience engagement.

15 to 18 June 2026 | 9:00AM – 5:30PM

	AM		PM		
	9.00AM – 10.30AM	11.00AM – 12.30PM	2.00PM – 3.30PM	4.00PM – 5.30PM	
15 June - Mon		[WS1.1] Adapting South Asia's Water Systems in a Digital Age			
		[WS4.1] Economics for Climate-resilient Water Investments			
		[WS5.1] [#] Rethinking Water and Health: Integrating One Water and One Health		[WS5.2] Options and Opportunities to develop the next generation of (bio)sensors for chemical pollutants and microbiological contaminants in drinking water and wastewater	
	[WS6.1] Advancing Nitrous Oxide (N ₂ O) Monitoring: Global Protocols, Collaboration, and Pathways to Sector-Wide Action: Case Studies & Panel				
16 June - Tue			[WS2.1] Ceramic membranes for Pre-treatment of Seawater Desalination		
			[WS4.2] Adaptation Pathway Building Session Responding To Fluvial Flood Risk In Southeast Asia		
			[WS5.3] Practical lessons learned from peer-to-peer Water Cycle Partnerships, around the world (Lao PDR, Jordan, Kenya)		
		[WS5.4] Safeguarding Surface Waters: Tackling Harmful Algal Blooms and Taste & Odor Challenges			
		[WS6.2] Net zero for water utilities: Has momentum stalled – and how do we accelerate?			
17 June - Wed	[WS2.2] Overcoming the Social, Technical and Institutional Barriers to Direct Potable Reuse			[WS2.3] Incorporating Nature Based Water Treatment Solutions	
	[WS3.1] Sustainable Global Biosolids Management Strategies				
	[WS5.5] Our Next 10 years' Integrated Framework for Micro- and Nano plastic Surveillance and Health Relevant Assessment				
	[WS5.6] Tackling Health and Climate Resilience with WASH				
	[WS6.5] Data Centers: Strategies And Opportunities For The Water Sector				
18 June - Thu	[WS1.2] SWAN APAC Workshop: Transforming Digital Water for Shared Progress				
			[WS3.2] Nanobubbles: A New Frontier in Treatment Performance		
	[WS4.3] Integrated Flood Resilience for High-Density Coastal Cities				
	[WS4.4] Nature Based Solutions for Resilient Water Systems in Asia Pacific – maximizing infrastructure investment value.				
		[WS5.8] Investing in Climate Resilient Sanitation: Costs, Finance and Priorities for Action			
	[WS6.3] Expanding Circularity and Nexus in Water: What are the Leverage Points for Systems Change?				[WS6.4] Cross Sector Collaboration to Accelerate the Circular Water Economy

Session ends 12.45pm
^ Session ends 6pm

15 June 2026 (Monday) | 11:00AM - 3:30PM | Room 1

Synopsis

This workshop brings together water utilities, technology providers, and sector experts from India and Bangladesh to explore how digital transformation in South Asia’s water sector is translating into real operational impact. As utilities face increasing pressure from climate shocks, ageing infrastructure, and rapid urban growth, the session will highlight how technologies such as smart metering, leak detection, and real-time monitoring are becoming part of everyday utility operations. Through keynotes, expert discussions, and a fireside conversation, speakers will share practical insights on reducing non-revenue water, strengthening billing confidence, improving data-driven decision-making, and developing financing models that help digital solutions scale. The session concludes with interactive roundtables where participants explore practical “how-to” approaches for adapting water systems in a digital age.

Programme

11:00AM – 11:05AM	Welcome and Introduction
	Frederick Royan - SWAN Forum & Associate Partner, Frost & Sullivan
11:05AM – 11:25AM	Keynote
	Narendran Maniam - Chief Executive Officer, Indah Water Konsortium, Malaysia
11:20AM – 11:50AM	Transforming Digital Energy Efficiency in Indian Water Utilities
	Moderator: Frederick Royan - SWAN Forum & Associate Partner, Frost & Sullivan - Anil Sethi - Founder, iPumpnet/Pump Academy, India - Shanmugavel Subramaniam – Global Digital Water Leader, Schneider Electric, Singapore
11:50AM – 12:30PM	From Data to Decisions: Scaling Smart Water Networks Across South Asia
	Moderator: Ruchika Shiva – Asia Coordinator, IRC Wash, India - Giridharan Sengaia - Co-Founder, Chief Operating Officer, SmartTerra, India - Amit Vaidya – Director Growth Marketr, Xylem Vue, India - Mohd Soeb Iftekhar - Director of Programs, International Development Enterprise (iDE) Bangladesh, Bangladesh
12:30PM – 2:00PM	Lunch & Networking
2:00PM – 2:05PM	SWAN India Update
	Raveena Shinde - India Manager, SWAN Forum, India
2:05PM – 2:20PM	Keynote: Digital Tools, Human Proximity: Smart Network Management for Underserved Communities
	Audrey Thomas - Private Partnerships Officer, Better With Water, Philippines
2:20PM – 3:20PM	Interactive Roundtable Session
	1. NRW Beyond Audits: How can utilities move from periodic studies to continuous operational control?
	Led by: Vinod Singh, Regional Director – Asia and India, Jacobs, Singapore
	2. From Data to Trust: How can smart metering improve billing confidence and operational decision-making?
	Led by: Arun Subramanian - Co-Founder, EarthFokus, India
	3. Responding Under Pressure: How can cities manage floods, sewer overflows, and river pollution in real time?
	Led by: Siddharth Desai - Director, Kishor Pumps, India
	4. Equitable, Climate-Resilient SMART Networks: How can private sector-led models drive financially viable water access in South Asia?
	Led by: Ariful Islam - Program Manager, International Development Enterprise (iDE) Bangladesh, Bangladesh
	Md. Ashraful Alom - Technical Specialist, International Development Enterprise (iDE) Bangladesh, Bangladesh
3:20PM – 3:30PM	Closing Remarks

18 June 2026 (Thursday) | 9:00AM - 3:30PM | Room 1

Synopsis		
The 5th SWAN APAC Workshop will be held at Singapore International Water Week 2026 emphasising aligning people, technology, and policy, supported by strong foundations in data literacy, standardisation, governance, workforce capability, and cybersecurity. The workshop brings together Asia-Pacific and global water utilities at different stages of digital maturity to feature expert keynote presentations, insightful panels, interactive roundtables, an AI technical masterclass, and a utility-led reverse shark tank, followed by a fun drinks reception sponsored by Autodesk.		Sponsored by 
Programme		
9:00AM – 9:10AM	Welcome and Introduction	
	Emcee: Patrick Bonk – Principal, Water Tech, United States	
	Dr. Amir Cahn - CEO, SWAN Forum, United Kingdom	
9:10AM – 9:30AM	Keynote: Adaptive Governance and Innovation for Water Security	
	Datuk Ir Abdul Kadir Bin Mohd Din – Chairman, National Water Services Commission SPAN, Malaysia	
9:30AM – 10:20AM	Scaling Smart Metering: From Hype to High-Impact Panel	
	Moderator: Francisco Javier Fernández Delgado - Deputy Director - Telecontrol, Canal de Isabel II, Spain - Yiu Yan Tong - Senior Assistant Director, PUB, Singapore - Kosuke Wakabayashi - Director for Water Supply Division, Services Reform Promotion, The Bureau of Waterworks, Tokyo Metropolitan Government, Japan - George Theo, CEO, TasWater, Australia	
10:20AM – 10:30AM	SWAN Update	
	Zolboo Dashmyagmar - APAC Lead, SWAN Forum, United Kingdom	
10:30AM – 11:00AM	Networking Break	
11:00AM – 11:45AM	AI in Water: Game Changer or Costly Distraction?	
	Moderator: Chris Ryan - Head of Water Infrastructure APJC, Autodesk, Australia - Dr. Daniel Luan - Modelling Business Specialist, Shenzhen Water, China - Criselle P. Alejandro - President, Balibago Waterworks, Philippines - Deon de Jager – Deputy Director Water Services, George Municipality, South Africa	
11:45AM – 12:30PM	Utility Reverse Shark Tank	
	Utilities will share their most pressing challenges and what they are looking for from solution providers, with the chance for the audience to share their insights. Moderator: Tracy Britton – Technical Director Digital & Innovation, Stantec, United Kingdom - Martine Watson - Chief Digital & Information Officer, Urban Utilities, Australia - Eimear Christian - Head of Sustainability and Innovation, Irish Water, Ireland - Deon de Jager – Deputy Director, Water Services, George Municipality, South Africa	
12:30PM – 2:00PM	Networking Lunch	
2:00PM – 3:00PM	Interactive Roundtables	
	1. Unlocking Lifecycle Data: What foundations are needed to advance digital maturity across the asset lifecycle?	
	Led by Dr. Carolina Venegas Martinez - Senior Manager Business & Industry Strategy for Water, Autodesk	
	2. NRW’s Prevention Over Reaction: How can utilities turn loss into data-driven value?	
	Led by Mark Nicol - Commercial Director, HWM Global, Singapore	
	Puranut Wisutjindaporn (Pong) - Business Development Manager, Water Industry, Yokogawa, Singapore	
	3. Decarbonising Water Systems: How can utilities integrate low-carbon technologies and energy optimisation to advance toward carbon-neutral operations?	
	Led by Hiep Le - CEO, Turing, Singapore and Utility	
	Jeremy Chappel – Managing Consultant APAC, CSignum, United Kingdom	

	4. Leveraging AI for Productivity: How can utilities use AI to predict and automate process operation and optimisation?
	Led by Robin Wong - Founder and CCO, TeamSolve, Singapore
	Jason Lancelot - Senior Manager, InEight, Australia
	5. Getting the Basics Right: How do utilities build essential data, people, and process foundations before scaling digital tools?
	Led by Bharat Khanna – Director, Digital Water Solutions, GHD, Canada
	Dwike Riantara - Director, Water Loss Indonesia, Indonesia
	6. Scaling Smart Metering: How can utilities balance the financial value, customer trust, and operational impact with the scale?
	Led by Bruce Kain - Director of Water (Australia, New Zealand and Pacific Islands) Itron, Australia
	7. Financing the Digital Transition at Scale: How can utilities design delivery and financing models that scale smart water initiatives?
	Led by Alexis Van der Weyden – Economist & Director, Frontier Economics, Australia
	Olivier Pison – Head of Digital Solutions Asia, SUEZ, Singapore
	8. Building Digital-Ready Teams: How can utilities enable frontline teams to adopt and scale digital change?
	Led by Tertius Rust - Founder & Executive Director, The Innovation Consulting Company, South Africa
	Tracy Britton - Technical Director Digital & Innovation, Stantec, United Kingdom
3:00PM – 3:30PM	Roundtable Rapid Fire Recap
3:30PM – 4:15PM	Networking Drinks Reception Sponsored by Autodesk

16 June 2026 (Tuesday) | 2:00PM - 5:30PM | Room 1

Synopsis

As desalination capacity continues to expand globally, the long-term performance and energy efficiency of reverse osmosis (RO) systems have become increasingly dependent on the effectiveness of upstream pretreatment. Among the various operational challenges, membrane fouling remains one of the most critical limiting factors, directly impacting plant reliability, energy consumption, chemical usage, and overall operating costs. Robust and resilient pretreatment is therefore essential to ensure stable, cost-effective, and sustainable desalination operation.

In response to these challenges, ceramic membrane technology has emerged as a promising and robust alternative for seawater pretreatment. Owing to their superior mechanical strength, chemical resistance, high permeability, and tolerance to aggressive cleaning protocols, ceramic membranes offer enhanced operational resilience under harsh seawater conditions. In practice, ceramic membranes typically operate at higher sustainable fluxes than polymeric UF membranes, enabling higher water production rates. It has been estimated that ceramic membrane pretreatment systems may achieve energy savings of more than 70% compared to conventional polymeric UF-based pretreatment.

This workshop aims to provide participants with practical insights, evidence-based discussion, and a balanced assessment of ceramic membrane pretreatment, supporting informed decision making and accelerating the deployment of more energy-efficient and resilient desalination systems.

Programme

2:00PM – 2:05PM	Welcome Remarks by Session Moderator
	Prof. Hu Jiangyong - Group Head (Environmental and Sustainability), Director of the Centre for Water Research, Director, Environmental and Sustainability Engineering Programme, National University of Singapore, Singapore
2:05PM – 2:15PM	Understanding the importance and challenges of desalination pretreatment
	Jonathan Clement – Global Director, JAC Water, Singapore
2:15PM – 2:30PM	PUB’s experience with Desalination Pretreatment
	Daniel Tio - General Manager Tuas Desalination Plant, PUB, Singapore's National Water Agency, Singapore
2:30PM – 2:45PM	Pretreatment of algae-impacted seawater: Improving efficiency of in-line coagulation coupled with ceramic membrane filtration
	Dr Tai Zhong Sheng – Research Fellow, National University of Singapore, Singapore
2:45PM – 3:30PM	Panel Discussion
	Moderator: Prof. Hu Jiangyong - Group Head (Environmental and Sustainability), Director of the Centre for Water Research, Director, Environmental and Sustainability Engineering Programme, National University of Singapore, Singapore - Jonathan Clement – Global Director, JAC Water, Singapore - Daniel Tio - General Manager Tuas Desalination Plant, PUB, Singapore's National Water Agency, Singapore - Dr Tai Zhong Sheng – Research Fellow, National University of Singapore, Singapore
3:30PM – 4:00PM	Coffee Break
4:00PM – 4:20PM	Demonstration of Flat-Sheet Ceramic Membrane for the Pre-treatment of SWRO by Retrofitting into DAF System at Tuas Desalination Plant (TDP)
	Dr. Hiroshi Noguchi - Head of Membrane and Water Technology Centre, Meiden Singapore, Singapore
4:20PM – 4:40PM	Pre-treatment for SWRO membranes for Variable Salinity Desalination
	Christian Goebbert - Chief Technology Officer, Nanostone, Germany
4:40PM – 5:30PM	Panel Discussion
	Moderator: - Prof. Hu Jiangyong - Group Head (Environmental and Sustainability), Director of the Centre for Water Research, Director, Environmental and Sustainability Engineering Programme, National University of Singapore, Singapore - Jonathan Clement – Global Director, JAC Water, Singapore - Dr. Hiroshi Noguchi - Head of Membrane and Water Technology Centre, Meiden Singapore, Singapore - Christian Goebbert - Chief Technology Officer, Nanostone, Germany

17 June 2026 (Wednesday) | 9:00AM - 12:30PM | Room 9

Synopsis

This workshop convenes leaders from academia, engineering, regulation and social science to address the key barriers preventing the wider adoption of direct potable reuse (DPR) of water. Drawing on real-world case studies from twelve DPR schemes across five continents, practitioners and policy-makers will examine the technical, institutional and social dimensions of this critical water security challenge.

Three themed sessions — each opened by expert presentations followed by audience-led discussion — will explore:(1) technical treatment and monitoring barriers; (2) institutional and regulatory frameworks; and (3) social licence and community acceptance. A fourth facilitated focus group session will synthesise key findings and identify a shared roadmap for accelerating DPR adoption globally.

Programme

Session 1: Technical Barriers to Direct Potable Reuse

Overcoming the treatment, monitoring and water quality challenges of DPR

9:00AM – 9:05AM	Welcome Remarks
	Michael Storey - President IWA Australia, Director of Innovation SUEZ, Australia
9:05AM – 9:15AM	Emerging Contaminants And Real-Time Monitoring: Defining The Frontier Of DPR Safety
	Josef Lahnsteiner - Goreangab Water Reclamation Plant Windhoek, Namibia
9:15AM – 9:25AM	Community engagement: Lessons from Parañaque City DPR scheme
	Maria Melliza Gayle R. Lucas - Head of Capex Planning Department, Maynilad Water Services, Philippines
9:25AM – 9:35AM	Closing the Urban Water Loop: Multi-Barrier Treatment for Direct Potable Reuse in Flanders, Belgium
	Kris Gorrisen - Bio-engineering Expert, WPC Hofstade, Belgium
9:35AM – 9:45AM	Open Q&A with all three speakers and audience

Session 2: Institutional Barriers to Direct Potable Reuse

Navigating regulatory frameworks, governance gaps and policy pathways

9:45AM – 9:50AM	Welcome Remarks
	Darryl Day - Chair IWA Australian Committee, Australia
9:50AM – 10:00AM	Advancing DPR policy: The US Experience And The Road To National Regulation
	Melanie Tan - West Resilience Solutions Director, Black & Veatch, United States
10:00AM – 10:10AM	A Regulatory Perspective On Potable Reuse In Australia
	Dr David Cunliffe - Principal Water Quality Adviser, SA Health, Australia
10:10AM – 10:20AM	The South African Institutional Pathway: Regulation, Governance And DPR
	Jennifer Molwantwa - CEO, Water Research Commission, South Africa
10:20AM – 10:30AM	Open Q&A with all three speakers and audience
10:30AM – 11:00AM	Coffee Break

Session 3: Social Barriers to Direct Potable Reuse

11:00AM – 11:05AM	Welcome Remarks
	Lorena Oliviera - Vice Chair, IWA Australia, Australia
11:05AM – 11:15AM	Optimising Treatment Train Performance And Potable Reuse Monitoring At Scale
	Rafael Villegas – Program Manager, Los Angeles Department of Water and Power, United States
11:15AM – 11:25AM	Managing Community Engagement on Indirect Potable Reuse

	Kathryn Heaton – Manager, Treatment Section, Water Corporation, Australia
11:25AM – 11:35AM	The Swedish Social Licence Challenge: Local Government Perspectives On Community Readiness For Potable Reuse
	Linda Holm - Mörbylånga Self-Adapting Water Reuse Plant, Sweden
11:35AM – 11:45AM	Open Q&A with all three speakers and audience
11:45AM – 12:25PM	Facilitated Workshop Discussion
	Participants will break out into nine focus groups that will be moderated by IWAA Committee Members, including but not limited to Michael Storey, Lorena Oliviera, Darryl Day, Tom Mollenkopf, Annalisa Contos, Kathryn Heaton, Steve Capewell, Wayne Middleton, Daniel Deere: Focus groups will feature speakers from all three sessions and will synthesise key findings, identify priority actions and agree on a shared roadmap for accelerating DPR adoption globally: Key themes: near-term barriers to scale-up; regulatory harmonisation; changing the public narrative; commitments for attendees:
12:25PM – 12:30PM	Closing Remarks
	Michael Storey - President IWA Australia, Director of Innovation SUEZ, Australia

17 June 2026 (Wednesday) | 4:00PM - 5:30PM | Room 6

Synopsis

Nature based solutions for treating water and wastewater involve using the natural systems to improve treatment utilize natural processes and ecosystems to improve water quality, enhance availability, and provide multiple environmental and social benefits. In particular the benefits are wide ranging and significant including improved water quality, enhanced water availability, climate resilience, biodiversity support, and community benefit.

For nature based solutions there is no single universal approach depends highly on the local geology, demographics, climate, and purpose. This workshop will give case studies from utilities from around the world to provide insights into the alternative approaches.

Programme

4:00PM – 4:10PM	Introduction
	Jonathan Clement - Global Director, JAC Water
4:10PM – 4:15PM	Nature Based Solutions: We love them – just not for everybody.
	Dr Bob Stear - Chief Engineer, Severn Trent Plc, UK
4:15PM – 4:25PM	Nature Based Solution from as a Dutch Utility
	Doeke Schippers - Director of Water Production and Distribution, Vitens, Netherlands
4:25PM – 4:35PM	Modelling and Design of a Unique Modular Process Basin within an existing Lake - Vitens Living Lab – Phase 1
	Rene Hoeijmakers - Global Service Line Director, Water & Wastewater Treatment Ramboll, Netherlands
4:35PM – 4:45PM	Sydney Macroalgae Biofactory for Advanced Treatment Of Wastewater
	Antony Gibson - Chief Development Officer, Pacificbio, Australia
4:45PM – 4:55PM	Deployment of Constructed Wetlands For Underserved Community Sanitation In Brazil
	Dr Shane Snyder – Professor, Georgia Institute of Technology, United States
4:55PM – 5:25PM	Panel Discussion with Audience
5:25PM – 5:30PM	Closing Remarks
	Jonathan Clement - Global Director, JAC Water

17 June 2026 (Wednesday) | 9:00AM - 12:30PM | Room 4

Synopsis

The safe & sustainable management of Biosolids is an essential requirement for society and is becoming more acute, with growing populations, increasing connectivity to sewer networks and wastewater treatment, enhancement of environmental standards (land, air and water), improved standards of living and ever-increasing demands upon resources, such as water, energy and nutrients. These global drivers and significantly greater societal awareness are stressing current deployment routes and influencing how we will manage Biosolids in the future. We are also witnessing immediate challenges namely emerging contaminants of concerns (PFAS, micro and nano-plastics), a desire to enhance the environment, reduce emissions from; and the carbon footprint of Biosolids operations. The drive to enhance circularity, resilience and self-sufficiency is in addition enhancing awareness and desire to extract value from the waste we produce, Wastewater and Biosolids are a reservoir of opportunity, from water itself through to Sustainable aviation fuel.

Clearly, we have reached a pivot point for Biosolids management across the world with both push and pull drivers influencing decisions to varying degrees. However, time is not on our side, the Water sector is being presented with a significant immediate challenge to the sustainability of their existing biosolids management strategies, particularly those focused upon recovery of Biosolids to agriculture. Their task is being exacerbated, with a need to navigate immediate operational challenges posed by this uncertainty against a backdrop of adverse societal perceptions being driven through the media and lobby groups. To fundamentally deviate from a strategy and transition to a wholesale alternative takes time, a clear demand / outlets for the outputs produced, navigation of potentially different commercial & operational models and sufficient confidence to invest.

To align our global biosolids strategies, plans and research, we must balance current complexities with our shared vision for the future. While managing pollution, emissions, and rising costs, we are simultaneously unlocking breakthroughs in circularity and resource resilience. This pivotal moment allows us to transform emerging contaminants into catalysts for innovation, establishing a viable, affordable, and sustainable roadmap within the urgent timeframe required for a truly regenerative water economy. The workshop sets out to enable a collective understanding of the tensions and challenges we are trying to mitigate and specifically how to proceed in the face of significant challenges - pollution, emissions, emerging contaminants, rising costs to treat, while seizing opportunities- enhancing circularity, self-sufficiency and resilience. And importantly the timeframe in which we must develop a viable, affordable & sustainable solution. The panel and conference attendees bring a collective knowledge of the current R&D and innovation undertaken across the globe to mitigate the challenges, enhance our understanding of sustainable strategic alternatives, and leverage opportunities for greater circularity to enhance our ability to make least regrets strategy and investment interventions and maximise funding & effort.

Collating our knowledge and thus gaining a consensus of the key priorities of action, the key collaborations required, and the engagement needed will aid us to facilitate development of an action plan / roadmap to aid knowledge enhancement, technology deployability, off-taker market readiness (demand & awareness), Policy & regulation & strategy deployability we can collectively support and drive.

Programme

9:00AM – 9:10AM	Welcome Remarks
	Richard Lancaster - Global Bioresources Director, AtkinsRealis, United Kingdom
9:10AM – 9:20AM	Singapore’s Biosolids Management Strategies and Future Plans
	Gurdev Singh - Chief Engineering and Technology Officer, PUB Singapore's National Water Agency, Singapore
9:20AM – 9:30AM	Australian Water Perspective and Adaptive Pathways for Biosolids management
	Adam Lovell - Executive Director, Water Services Association of Australia (WSAA), Australia
9:30AM – 9:40AM	A Catalyst For Circularity And Systems Thinking
	Mike Rose - CEO, UK Water Industry Research, United Kingdom
9:40AM – 9:50AM	Supporting Canada in becoming more Circular, Resilient and Sustainable through Exploiting Recoverable Resources specifically Wastewater derived fertiliser and heat transfer
	Nicola Crawhall – CEO, Canadian Water Network, Canada
10:00AM – 10:10AM	UK & EU Perspective Biosolids Management strategies
	Jokin Larrauri - Director, CIMICO, Spain
10:10AM – 10:20AM	HRSD’s Biosolids Strategy: Building Resilience Through Diversification
	Jay Bernas - General Manager/CEO Hampton Roads Sanitation District, United States
10:20AM – 10:30AM	China perspective on Biosolids Management
	Aaron Zhang – Head of Investment and Business Development, China EVERBRIGHT Water Ltd, Singapore

10:30AM – 11:00AM	Networking Break
11:00AM – 11:45AM	Panel Q&A Interactive Session
11:45AM – 12:20PM	Roundtable Discussion
12:20PM – 12:20PM	Chair/Panel Playback and Closing Remarks

[WS3.2] NANOBUBBLES: A NEW FRONTIER IN TREATMENT PERFORMANCE	
18 June 2026 (Thursday) 2:00PM - 3:30PM Room 4	
Synopsis	
Nanobubble technology is rapidly emerging as a promising innovation for improving water and wastewater treatment performance. This workshop brings together leading international researchers, utilities, and technology providers to provide a balanced and evidence-based discussion on the real-world applications of nanobubbles in the water sector. The session will explore how nanobubbles can enhance processes such as oxidation, aeration, algal control, and contaminant removal, while also examining the operational realities of implementing these systems at pilot and utility scales. Through a panel discussion and interactive audience engagement, the workshop will highlight lessons learned from ongoing trials around the world, what has worked, what challenges remain, and what is required to advance the technology from experimental pilots to reliable treatment solutions. Participants will contribute to identifying priority research directions and collaborative pathways between utilities, academia, and industry to accelerate adoption of nanobubble technologies for improved water quality and treatment resilience.	
Programme	
2:00PM – 2:05PM	Opening Remarks by the Chairs and Panel introduction
	Dr Arash Zamyadi - Senior Lecturer, Monash University, Australia
	Dr Chee Meng Pang – Director Water Quality, PUB, Singapore's National Water Agency, Singapore
2:05PM – 2:15PM	The science behind nanobubbles
	Prof Tsai Fuh Lin – Professor, National Cheng Kung University, Taiwan
2.15PM – 2:25PM	Ozone nanobubbles for water treatment: From a Water Research Foundation trial leading innovation
	Dr Stephen Capewell - Managing Director, Goulburn Valley Water, Australia
2:25PM – 2:35PM	Pioneering Nanobubble Large-Scale Trials In The Water Industry
	Jason Cotton - Managing Director, Intelligent Water Networks (IWN), Australia
2:35PM – 2:45PM	From Physics to Production: Manufacturing Nanobubble Systems
	Damian Serong - CEO of SA2050, Australia
2:45PM – 3:20PM	Guided Group Discussions
3:20PM – 3:30PM	Closing Remarks by the Chairs
	Dr Arash Zamyadi - Senior Lecturer, Monash University, Australia
	Dr Chee Meng Pang – Director Water Quality, PUB, Singapore's National Water Agency, Singapore

15 June 2026 (Monday) | 11:00AM - 12:30PM | Room 4

Synopsis

This interactive workshop explores how economic thinking can unlock and accelerate climate resilient investment in the water sector. It will open with an overview of key economic frameworks for valuing resilience benefits, strengthening decision making under uncertainty (including water quality risk, rebuilding infrastructure), and balancing essential investment with customer affordability. Participants will then hear practical lessons from international and Southeast Asian case studies where economics has supported real-world delivery of resilient water investments. The workshop concludes with a short breakout exercise, where attendees apply the concepts to their own context by identifying priority challenges, the enabling conditions needed, and the core elements of a robust business case—covering economic and financial viability, distributional impacts, and deliverability and performance monitoring.

Programme

11:00AM – 11:05AM	Welcome Remarks
	Christian Nyerup - Global Service Line Director for Climate Adaptation, Ramboll, Netherlands
11:05AM – 11:20AM	Economics for Climate Resilient Water Investments
	Alexus Van der Weyden - Economist & Director, Frontier Economics, Australia
11:20AM – 11:35AM	Case Studies
	Pragas Nadaraja – Sustainable Design Director, Ramboll
11:35AM – 12:00PM	Breakout 1: The investment Case
	The breakout sessions will engage the audience to have the hands-on challenge of starting to prepare a business case. It will use economics to value intangibles and uncertainty in our two case studies.
12:00PM – 12:25PM	Breakout 2: The Delivery Case
	This breakout session will use the same case studies and focus on funding climate resilience.
12:00PM – 12:25PM	Breakout Sessions
	The breakout sessions will engage the audience to have hands on challenge of starting to prepare a business case for their own challenges in their societies.
12:25PM – 12:30PM	Closing Remarks
	Alexus Van der Weyden - Economist & Director, Frontier Economics, Australia

16 June 2026 (Tuesday) | 4:00PM - 5:30PM | Room 4

Synopsis

Adaptation Pathways are an innovative approach to respond to changing risks over long-term horizons – we have developed adaptation pathways in the UK, Australia, Ireland, and the US, and were the first to develop pathways responding to fluvial flood risk in the UK, addressing escalating climate risks in diverse settings.

We have developed, and practically applied, an innovative adaptation pathways approach, underpinned by the British Standard on climate adaptation, to enable regional resilience and adaptation in a changing and uncertain future. This approach has helped develop insight around what adaptation pathways look like and how they can be formed in short timescales, using specialist and local expertise.

In this session we will share practical insights from these global case studies and, participants will be applying the approaches that we have developed to develop adaptation pathways for two Southeast Asian catchments:

- Sungai Klang (Klang River), Malaysia – an urban context
- Ci Manuk (Manuk River), Indonesia – a rural context

Through our workshop, participants will learn:

- How to apply innovative, strategic approaches that underpin adaptation planning to respond to changing conditions over time,
- How adaptation pathways can maximise wider benefits, not only for flood resilience, but also for people and the environment,
- How a collaborative approach can support rapid decision-making, and lastly,
- What enabling conditions are required to deliver flood resilience in the face of a changing climate.

We will end the session with a presentation, outlining practical applications of adaptation pathways and how they can be stress tested against a range of scenarios and translated to short-term on-the-ground action.

Programme

4:00PM – 4:15PM	Introduction
	• Nina Noreika - Senior water Consultant, Arup, United Kingdom
4:15PM – 5:05PM	Sequencing of Portfolios Into High-Level Pathways & Stress Testing
	Facilitators:
	• Nina Noreika - Senior Water Consultant, Arup, United Kingdom
	• Eleanor Earl - Senior Consultant Resilience & Adaptation, Arup, Australia
	• Celeste Morgan - Integrated Water Management Lead, Arup, Australia • Justine Jones - Flooding and Surface Water Design Leader, Arup, Malaysia • George Hill - Civil and Water Engineer and Water Skills Network Manager, Arup, Australia
5:05PM – 5:25PM	Group Discussion
	• Nina Noreika - Senior water Consultant, Arup, United Kingdom
5:25PM – 5:30PM	Presentation
	• Nina Noreika - Senior water Consultant, Arup, United Kingdom

18 June 2026 (Thursday) | 9:00AM – 12.00PM | Room 5 & 6

Synopsis

Climate change is intensifying flood risks through more frequent extreme rainfall events and complex urban topography, posing systemic threats to high-density coastal cities worldwide. Building effective flood resilience demands an integrated approach that combines forward-looking engineering planning, resilient and robust infrastructure and measure for integrated flood management, and AI-driven monitoring systems for intelligent early warning and high-level coordination.

This workshop will examine how these elements work synergistically to enable dynamic adaptation and resilience, reduce disaster losses, and minimise systemic failure. Through expert presentations, real-world case studies and best practices from coastal cities, together with collaborative discussion, participants will gain valuable insights into innovative governance models, technological and intelligent solutions, and practical strategies that can be adapted to diverse coastal urban areas worldwide.

Programme

9:00AM – 9:05AM	Welcome Remarks
	Ringo Mok - Director, Drainage Services Department, Hong Kong SAR China
9:05AM – 9:15AM	Opening Address
	Zu Leiming - Vice Minister, Ministry of Water Resources, China
9:15AM– 9:25AM	Introductory Remarks by Panel Moderator
	Prof Lee Hun Wai Joseph - Director of the Key Laboratory of River Basin Digital Twinning of Ministry of Water Resources and Chief Scientist, Macau University of Science and Technology, Macau SAR China
9:25AM – 9:40AM	Innovative Approaches to Forging Resilient Flood Prevention and Drainage Systems for Densely Populated Cities - Hong Kong's Pioneering Strategy and Groundbreaking Practices
	Ian Wan Cheuk-keung – Chief Engineer/Drainage Projects, Drainage Services Department, Hong Kong SAR China
9:40AM – 9:55AM	Strategies and Case Studies for Enhancing Flood Resilience of Coastal Cities under Climate Change
	Dr Peng Wen-qi - Chief Engineer, China Institute of Water Resources and Hydropower Research, China
9:55AM – 10:10AM	Strengthening Singapore’s Coastal and Flood Resilience with CFI Singapore
	Prof Adrian Law – Director CFI, National University of Singapore, Singapore
10:10AM – 10:25AM	Rapid Flood Simulation Based on Explainable Artificial Intelligence (XAI) – Case Studies of Greater Bay Area
	Prof Wang Zhaoli - Director of Guangdong Provincial Research Center for Hydraulic Engineering Safety Technology, South China University of Technology, China
10:25AM – 11:00AM	Networking Break
11:00AM – 11:15AM	Enhancing Resilience to Urban Flooding and Storm Surge in the Guangdong-Hong Kong-Macao Greater Bay Area Innovative Practices
	Prof Yang Fang - Vice President, Pearl River Water Resources Research Institute, China
11:15AM – 11:30AM	Navigating Coastal Risks in a Changing Climate: Hong Kong’s Proactive and Holistic Plan to Manage Shorelines for the Future
	Cheung Wing-hong - Chief Engineer /Port Works, Civil Engineering and Development Department, Hong Kong SAR China
11:30AM – 11:55AM	Panel Discussion
	Moderator: Prof Lee Hun Wai Joseph - Director of the Key Laboratory of River Basin Digital Twinning of Ministry of Water Resources and Chief Scientist, Macau University of Science and Technology, Macau SAR China - Ian Wan Cheuk-keung - Chief Engineer/Drainage Projects, Drainage Services Department, Hong Kong SAR China - Dr Peng Wen-qi - Chief Engineer, China Institute of Water Resources and Hydropower Research, China - Prof Adrian Law - Director CFI, National University of Singapore, Singapore - Prof Wang Zhaoli - Director of Guangdong Provincial Research Center for Hydraulic Engineering Safety Technology, South China University of Technology, China - Prof Yang Fang - Vice President, Pearl River Water Resources Research Institute, People's Republic of China - Cheung Wing-hong - Chief Engineer / Port Works, Civil Engineering and Development Department, Hong Kong SAR China
11:55AM – 12:00PM	Closing Remarks
	Johnny Chan Chi-ho - Deputy Secretary for Development, Development Bureau,Hong Kong SAR China

18 June 2026 (Thursday) | 9:00AM - 12:30PM | Room 8

Synopsis

Cities across Asia Pacific are facing intensifying water related risks driven by climate change, rapid urbanisation, and long standing modification of natural systems. Increasingly, cities must manage too much water—from pluvial, fluvial, coastal, and groundwater flooding—alongside too little water, including drought and seasonal water stress. At the same time, climate driven impacts such as saline intrusion, ecosystem degradation, and pollution are undermining water quality and public health. These challenges cannot be addressed through single sector or single asset solutions. Urban water resilience depends on understanding cities as interconnected systems, where land use, transport, drainage, rivers, coastlines, energy, communities, and ecosystems interact across spatial and temporal scales. Nature based and hybrid (grey/green) solutions are widely endorsed and technically proven – but despite growing interest, they continue to struggle to scale. The challenge is not whether Nature

Based solutions work, but how they move along the full value chain: from problem definition and risk reduction, through design and governance, to delivery, finance, and long term stewardship and resilience. Breakdowns at any point in this value chain – such as misaligned objectives, fragmented institutions, weak business cases, or a lack of investable pipelines – can prevent Nature Based solutions from progressing beyond pilots.

The workshop brings together global development finance institutions and technical leaders, including perspectives from the World Bank, the Asian Infrastructure Investment Bank (AIIB), and Arup. Collectively, these organisations are currently supporting river restoration, coastal resilience, sponge city, and nature based infrastructure programmes at scale across Asia Pacific—from early diagnostics and project preparation through to financing, delivery, and long term stewardship.

This 3.5 hour interactive workshop explores how nature based and hybrid solutions can be embedded into resilient urban water systems across Asia Pacific, and how cities can move from pilots and concepts to city scale, financeable, and deliverable programmes. Drawing on real world experience from river restoration, coastal resilience, sponge city approaches, and MDB supported investments, the session will combine expert presentations, panel discussions with roundtable Interactive NbS Solutions Accelerator working sessions.

The workshop will place equal emphasis on technical design, governance and coordination, and financing pathways, helping participants understand not only what resilient water systems look like, but how they can be implemented and scaled in practice. The session will conclude with participates input into the synthesis of key principles and “next moves” for nature based solutions in urban water systems across the region.

Participants will leave with:

- A systems based understanding of urban water resilience challenges in Asia Pacific;
- Practical examples of nature based and hybrid solutions applied at city scale;
- A framework for assembling Nature Based solutions portfolios that address floods, drought, and water quality together; and
- Clear insights into the institutional and financing steps needed to turn NbS concepts into investable, deliverable projects.

Programme

9:00AM – 9:10AM	Welcome & Framing
	• Scott Dunn - Chief Strategy Officer, AECOM, Singapore
9:10AM – 9:55AM	What does “naturally resilient infrastructure” look like?
	• Eleanor Earl - Senior Consultant - Resilience & Adaptation, Arup, Australia
9:55AM – 10:40AM	What does “naturally resilient infrastructure” look like?
	• Eileen Burke - Global Lead for Water Resources, Lead Water Resources Management Specialist, World Bank Group, United States
10:40AM – 11:00AM	Networking Break
11:00AM – 11:45AM	From Feasibility to Financing: Scaling NbS at City Level
	• Carsten Huttche - Senior Environment Specialist, Sustainability and Fiduciary Solutions Department, Asian Infrastructure Investment Bank (AIIB), China

15 June 2026 (Monday) | 11:00AM - 12:45PM | Room 5

Synopsis

The One Water and One Health concepts have independent origins—the former in integrated water resource management and the latter in public health. The concept of One Health recognizes that the health of animals and humans is inextricably linked to the health of environment. Conversely, One Water is a much newer concept, catalyzed by a growing need for the more systematic and efficient management of water resources, particularly in regions of water scarcity. Yet these two concepts often operate in parallel, rather than in partnership. This workshop will bridge this gap by demonstrating how integrated water management can directly support One Health outcomes, particularly in the context of climate change, urbanization, agricultural intensification, and emerging infectious diseases.

By bringing together concepts from water management, environmental microbiology, and risk assessment, this workshop will provide participants with a practical framework for incorporating health-based thinking into water management.

Programme

11:00AM – 11:05AM	Welcome Remarks
	Dr John Sabo - Professor, ByWater Institute, Tulane University, United States
11:05AM – 11:15AM	Overview of One Water & One Health concepts and Conceptual model linking One Water & One Health
	Dr Tiong Gim Aw - Public Health Microbiologist, Tulane University, United States
11:15AM – 11:45AM	Case studies in action - Examples illustrating integration of One Water & One Health
	I. Water reuse for sustainable development
	Dr Elaine Quek - Chief Specialist PUB, Singapore's National Water Agency, Singapore
	II. Agriculture perspectives
	Dr Erinda Lika - Professor, Agricultural University of Tirana, Albanie
	III. Antimicrobial resistance
	Dr Nicholas Ashbolt - Professor, Cooperative Research Centre for Solving Antimicrobial Resistance in Agribusiness, Food and Environments (SAAFE CRC), Australia
	IV. Infectious disease surveillance
	Dr Gertjan Medema - Principle Microbiologist, KWR Water Research Institute, Netherlands
11:45AM – 12:10PM	Interactive breakout activity
	<i>Participants will work in small groups with a facilitator. Each group will (i) map key water pathways, (ii) identify health risks and stakeholders, (iii) identify data needs, and (iv) propose integrated interventions.</i>
	I. Designing a One Water - One Health Strategy For A Growing Urban-Agricultural Region
	Dr Siao Yun Chang - Chief Specialist, PUB, Singapore's National Water Agency, Singapore
	II. Harmful Algal Blooms And Ecosystem Health
	Dr Karina Gin - Professor, National University of Singapore, Singapore
	III. Managing Stormwater To Reduce Ecosystem And Community Health Risks
	Dr John Sabo - Professor, ByWater Institute, Tulane University, United States
12:10PM – 12:30PM	Report back and Synthesis
	Dr Joan Rose - Homer Nowlin Chair in Water Research, Michigan State University, United States
12:30PM – 12:40PM	Artificial intelligence (AI)-driven tools for One Water & One health
	Dr Gang Liu - Deputy Director of the Key Lab for Drinking Water Science and Technology, Research Center for Eco-Environmental Sciences, China
12:40PM – 12:45PM	Concluding Remarks
	Dr Tiong Gim Aw - Public Health Microbiologist, Tulane University, United States

[WS5.2] OPTIONS AND OPPORTUNITIES TO DEVELOP THE NEXT GENERATION OF (BIO)SENSORS FOR CHEMICAL POLLUTANTS AND MICROBIOLOGICAL CONTAMINANTS IN DRINKING WATER AND WASTEWATER

15 June 2026 (Monday) | 2:00PM - 5:30PM | Room 5

Synopsis

This workshop will explore the latest developments in the field of (bio)sensors and their applications for the monitoring and surveillance of chemical pollutants and microbial contaminants (and including antimicrobial resistant bacteria and genes) in the context of water and wastewater quality management needs and challenges. The workshop will have the following objectives:

- Participants to be informed about expected developments and trends in chemical pollution and microbial contamination of source water, drinking water, recreational water and wastewater and the associated health and ecosystem risks, and about future detection and monitoring needs and options to respond to these adequately and effectively.
- Participants to be updated on how (bio)sensors operate, the techniques and materials involved, types of (bio)sensors specific to chemical pollutants and microbial contaminants, integrating systems including AI and IoT/LoT (Internet of Things/Language of Things), applications and case studies and finally the current status and trends with respect to (bio)sensors for the detection and monitoring of chemical pollutants and microbial contaminants in source water, drinking water, recreational water and wastewater.

And, in the break-out group discussions and plenary discussions:

- To identify and assess options and opportunities for innovative, more reliable, more sensitive, more efficient and faster -preferably real-time- (bio)sensors to detect pollutants and contaminants in source water, drinking water, recreational waters and wastewater.
- To propose research needs and priorities for the further development of such (bio)sensors, and for their individual and networked deployment.
- To propose regulatory and policy issues that will help optimize the enabling environment for the deployment of existing and new, innovative (bio)sensors.
- To give special consideration to the need to address the looming challenges of antimicrobial resistance and how innovative technologies can tackle these through cutting edge genetic and other approaches, including a role for AI.

Programme

2:00PM – 2:05PM	Welcome Remarks
	• Dr Robert Bos – Independent Consultant, Switzerland
2:05PM – 2:15PM	Outlook and Trends in Drinking Water Quality and what (bio)sensor development is needed to address these
	• Dr Bruce Gordon - Unit Head of Water, Sanitation, Hygiene and Health WHO, Switzerland
2:15PM– 2:25PM	What is a (bio)sensor and what are sensor networks with smart and connected devices, sensor networks, AI.?
	• Dr Raghav Narayan - Co-Founder and CEO, Aprisium, Singapore
2:25PM – 2:35PM	Trends in (bio)sensor research, the latest in (bio)sensor development and application. (DNA based monitoring: advanced biological recognition, CRISP, aptamers)
	• Prof Ana Maria de Roda Husman, National Institute for Public Health and Environment (TBC)
2:35PM – 2:45PM	Regulatory/Policy Issues
	• Dr Pranav Joshi – Senior Assistant Director, Drinking Water Regulatory Unit, Operations Management Department, Singapore
2:45PM – 2:55PM	Interactive Q&A and Panel session
2:55PM – 3:05PM	Innovative (Bio)sensors to detect Microbial Contaminants
	• Prof Masaaki Kitajima – Professor, University of Tokyo, Japan
3:05PM – 3:15PM	Innovative (Bio)sensors to detect Chemical Pollutants
	• Dr Raghav Narayan - Co-Founder and CEO, Aprisium, Singapore
3:15PM – 3:25PM	Regulatory/policy Issues influencing (Bio)sensor Deployment
	• Dr David Cunliffe - Principal Water Quality Adviser, SA Health, Australia
3:25PM – 3:35PM	Integrated Environmental Monitoring Systems for Scalable Catchment Management
	• Rod Naylor - Global Lead Water, GHD Pty Ltd, Australia
3.40PM – 4:00PM	Networking Break
4:00PM – 4:05PM	Breakout Group Explanation

	• Dr Robert Bos – Independent Consultant, Switzerland
4:05PM – 4:45PM	Breakout Discussion
	• Microbiology: Moderated by Prof Joan Rose - Homer Nowlin Chair in Water Research, Michigan State University, United States
	• Chemistry: Moderated by Dr Peter Grevatt - CEO, Global Water Research Coalition, United States
	• Regulatory/Policy: Moderated by Dr David Cunliffe - Principal Water Quality Adviser, SA Health, Australia
4:45PM – 4:50PM	Report back and Synthesis
4:50PM – 5:25PM	Interactive Q&A and Panel discussion
	• Prof Joan Rose - Homer Nowlin Chair in Water Research, Michigan State University, United States • Jennifer de France – Technical Officer, World Health Organisation, Switzerland • Dr Peter Grevatt - CEO, Global Water Research Coalition, United States • Dr Pranav Joshi – Senior Assistant Director, Drinking Water Regulatory Unit, Operations Management Department, Singapore
5:25PM – 5:30PM	Final Discussion

16 June 2026 (Tuesday) | 4:00PM - 5:30PM | Room 5

Synopsis

At World Waternet, we work according to the Water Cycle Approach. This approach sees the whole water cycle as one integrated system, connecting (drinking) water management, wastewater treatment and water quality, and brings water partnerships together at regional, national, local and community Levels.

Our approach aligns with Recommendation 1 of the Global Commission on the Economics of Water (GCEW) report: “We must govern the hydrological cycle as a common good , recognising our interdependence through both blue and green water flows; the deepening interconnections between the water crisis, climate change, and the loss of the planet’s natural capital; and how water flows through all our 17 Sustainable Development Goals”

We regenerate - actively restoring and renewing - different aspects of the local water cycles peer-to-peer with our Water Operators' Partnership based in the Global South and stimulate the transition to a Water Cycle Partnership (WCP). Regenerative means actively restoring and renewing the natural water cycle rather than merely managing or extracting from it. It goes beyond sustainability - not just reducing harm, but rebuilding the health, resilience and balance of water systems at every level, from local watersheds to global hydrological flows. In the Water Cycle Approach, regenerative practice means that each intervention - whether in drinking water, wastewater or water quality - contributes to the vitality of the whole cycle, for people and ecosystems alike.

In this interactive session you will experience the Water Cycle Approach through practical impact stories around the world, such as sustainable optimization of the wastewater system in Irbid together with Yarmouk Water Company in Jordan, strengthening climate-resilient compact water treatment plants with Nam Papas in Lao PDR and Catchment to Tap to bring back the Njururi Beetle with Water Resources Authority in Kenya and dreaming about a Swimmable Mathare River - with practical learnings from the Amsterdam City Swim. We want the audience to actively participate to share their lessons learned on Water Cycle Partnerships and if we can connect the dots forward towards our Collective Water Cycle Action agenda towards UN2026.

Programme

4:00PM – 4:05PM	Welcome Remarks
	Frodo van Oostveen - Chief Executive Officer, World Waternet, Netherlands
4:05PM – 4:10PM	Global Water Cycle Partnerships
	Henk Ovink - Executive Director, Global Commission on the Economics of Water, Netherlands
4:10PM – 4:20PM	Local Water Cycle Partnerships in Kenya, Jordan and the Netherlands (Video presentation)
	Ayman Kasseem - Project Manager, World Waternet, Jordan
	Simon Muturi - Project Manager, World Waternet, Jordan
4:20PM – 4:30PM	Local Water Cycle Partnerships
	Mick Morada - Project Leader, WaterWorX, World Waternet, Laos
4:30PM – 5:00PM	Roundtable Deep Dive
	Hosted by Peter Jansen - Project leader, WaterWorX, World Waternet, Laos
	I. How to improve sewerage, treatment efficiency, and urban water resilience in Jordan’s cities?
	Facilitator: Frodo van Oostveen - Chief Executive Officer, World Waternet, Netherlands
	II. How to shape a sustainable future for the Mathare River in Kenya: From source to tap?
	Facilitator: Henk Ovink - Executive Director, Global Commission on the Economics of Water, Netherlands
	III. How to support water utilities to improve water services in Lao PDR?
	Facilitator: Mick Morada - Project Leader, WaterWorX, World Waternet, Laos
5:00PM – 5:30PM	Collective Water Cycle Action Roadmap to UN2026 (UAE)

16 June 2026 (Tuesday) | 4:00PM - 5:30PM | Room 7

Synopsis

With global warming and the increasing eutrophication of surface waters worldwide, the risk of harmful algal blooms is rising. These blooms can significantly impact surface water intakes from lakes, dams, reservoirs, and rivers by elevating concentrations of microcystins and introducing taste and odor compounds such as MIB and geosmin.

This workshop will bring together experts in field of monitoring, modeling,oxidation of taste and odour compounds as well as operators and designers who have successfully addressed these challenges.

Programme

4:00PM – 4:05PM	Welcome Remarks & Introduction
	Peck Chuan Siow – Director, Project Management-Engineering APAC, Xylem, Singapore
4:05PM – 4:20PM	Oxidative and combined treatment solutions to combat MIB & Geosmin
	Dr Uwe Huebner - Senior Process Engineer Water Reuse & AOP, Xylem, Netherlands
	Harmful algal blooms (HABs) in surface waters pose a growing challenge for drinking water utilities worldwide. After a short introduction into HABs and related issues with taste & odor compounds, this presentation will address basic principles of ozonation and advanced oxidation processes (AOPs; i.e., O3/H2O2, UV/H22O2) for the for the reduction of 2- methylisoborneol (MIB) and geosmin. We will highlight advantages of individual AOPs and discuss treatment performance based on full-scale case studies applying ozonation and UV/H2O2.
4:20PM – 4:35PM	Prevention of algae blooms in big surface water reservoirs by optimal mixing and aeration through model-based analysis
	Eng. Pieter Vlasschaert - VP Sales and Solutions, AM-Team, Netherlands
4:35PM – 4:50PM	Reduce response times to HABS with AI technology for early detection and intervention
	Bruce Sproule - Director of Analytics for Southeast Asia and North Asia Subregion (SEA/NAS), Xylem, Singapore
	We will explore how AI agents can support harmful algal bloom monitoring, forecasting, and operational response using real-time water quality data and predictive analytics. The presentation explains the difference between dashboards, predictive models, and AI agents, and demonstrates how AI can transform environmental monitoring data into earlier warning, better operational decisions, and more actionable workflows. The session also highlights how YSI EXO water quality platforms provide the trusted field data foundation needed for effective HAB AI systems.
4:50PM – 5:05PM	Singapore’s experience in Managing T&O issues in Drinking Water
	Veronica Tan - Senior Specialist, PUB, Singapore's National Water Agency, Singapore
	Climate change and tropical conditions pose significant challenges to drinking water quality, particularly through the production of taste and odour (T&O) compounds such as geosmin and 2-methylisoborneol (2-MIB) by algae in source water reservoirs. This presentation presents a case study from Choa Chu Kang Waterworks (CCKWW) in Singapore, where an unprecedented increase in geosmin levels was observed at Kranji Reservoir in 2024. CCKWW's multi-barrier treatment train comprising coagulation and sedimentation, ozonation, ceramic membrane filtration, and Biological Activated Carbon (BAC) was proven to be effective in managing the episode, achieving non-detectable levels of geosmin levels in final treated water. As most of the geosmin was present in particulate, cell-bound form, coagulation played a critical upstream role in reducing T&O loading, while ozone dosages were adjusted adaptively throughout the episode. Bromate levels and customer feedback were closely monitored as additional safeguards. This case study highlights the value of a robust, multi-barrier treatment approach and adaptive operational strategies in managing T&O events driven by climate variability.
5:05PM – 5:25PM	Q&A
5:25PM – 5:30PM	Thank you and Closing Remarks
	Peck Chuan Siow – Director, Project Management-Engineering APAC, Xylem, Singapore

17 June 2026 (Wednesday) | 9:00AM - 10:30AM | Room 6

Synopsis

Research into micro- and nanoplastics (MNPs) has expanded rapidly in recent years, particularly in terms of detection methods and occurrence data. However, current monitoring efforts have remained largely fragmented, with data collection often limited to particle counts, polymer type, size distributions, and mass concentrations. This workshop will discuss whether these commonly monitored parameters are adequate for the development of a quantitative health risk assessment for MNPs, and explore which additional parameters may be required. Besides gaining knowledge on the latest scientific knowledge on the effects of MNPs on humans, the workshop aims to contribute to the future development of an integrated framework that supports management and regulatory decision-making. By bringing together leading experts, the workshop seeks to answer the following key questions:

- How robust is the current scientific evidence supporting the link between MNPs and their ecological and human health impacts? Are we overestimating or underestimating the associated risks? Which exposure pathway (e.g., drinking water, food, or air) contributes most significantly to human MNPs exposure? Are there currently any indicative safety exposure limits or threshold concentrations for MNPs that utilities can make reference to?
- What are the most critical knowledge gaps or uncertainties that limit the development of a quantitative risk assessment for MNPs?
- Are common parameters being monitored (such as MNP particle counts and mass concentrations, and size distributions) adequate for risk assessment purposes? Are there any other parameters that should also be monitored? Which of the above-mentioned critical knowledge gaps or uncertainties should be prioritised for research in the next 5 years?

Programme

9:00AM – 9:05AM	Welcome Remarks
	• Dr Yoorae Noh - Assistant Professor, Michigan State University, United States
9:05AM – 9:25AM	Invited Expert’s Presentation #1
	• Dr. Kevin Thomas - Professor and Director of the Queensland Alliance for Environmental Health Sciences, The University of Queensland, Australia
9:25AM – 9:45AM	Invited Expert’s Presentation #2
	• Dr. Stefan Kools - Team Leader, KWR Water Research Institute, Netherlands
9:45AM – 10:05AM	Invited Expert’s Presentation #3 (Video presentation)
	• Dr. Chelsea Rochman - Associate Professor, University of Toronto, Canada
10:05AM – 10:25AM	Panel Discussion and Audience Interaction
10:25AM – 10:30AM	Closing Remarks
	• Dr Grzegorz Lisak – Associate Professor, Nanyang Technological University, Singapore

17 June 2026 (Wednesday) | 9:00AM - 12:30PM | Room 5

Synopsis

Climate change may increase water-related diseases such as dengue fever, malaria or diarrhoea. Conversely, investments in water supply, sanitation, drainage and waste management (WASH) have the capacity to reduce disease risk and compensate for the impacts of climate change. This climate-resilient WASH encompasses infrastructure, services and behaviours that continue to deliver benefits, or can rapidly recover, under climate-induced shocks and stress.

The workshop consists of two sessions, before and after the break. The first session focuses on services by utilities and the second on the enabling environment. The sessions build on each other, but could be followed independently.

The workshop aims to improve the participants’ understanding of the interplay between climate hazards in Asia, potential health impacts, how WASH systems are exposed, and what all this means for the populations that rely on them. Mini-presentations provide examples of climate-resilient WASH services and how to shape enabling environments. In group discussions, participants can bring in their own needs, experiences and solutions (first session), or discuss how the enabling environment can be strengthened (second session).

Programme

Session 1: Tackling health and climate resilience with WASH: Services

Chair: Bruce Gordon, World Health Organization (WHO), Switzerland

9:00AM – 9:05AM	Introduction of topic and agenda by chair
	Bruce Gordon, World Health Organization (WHO), Switzerland
9:05AM – 9:15AM	Brief interactive introduction of participants
9:15AM – 9:35AM	Four Pitches
	Case studies Nepal and Bangladesh: Methods and Key results
	Eline Boelee – Expert Advisor Water & Health, Deltares, Netherlands
	Case studies Nepal and Bangladesh: Implementation and Update
	Neeta Pokhrel – Director of the Water and Urban Development Sector Office for the Pacific and Southeast Asia, Asian Development Bank, Philippines
	Case study Papua New Guinea Utilities Perspective
	Meckles Poya – Board Chairman, Water PNG, Papua New Guinea
	Global tools to support climate resilient WASH management
	Jennifer de France – Technical Officer, World Health Organisation, Switzerland
9:35AM – 9:40AM	Explanation of Discussion Themes
9:40AM – 10:05AM	Group Discussion
10:05AM – 10:20AM	Key takeaways from Each Group
10:20AM – 10:30AM	Summary and Wrap up by Rapporteur
10:30AM – 11:00AM	Networking Break

Session 2: Tackling health and climate resilience with WASH: Enabling environment

Chair: Eline Boelee – Expert Advisor Water & Health, Deltares, Netherlands

11:00AM – 11:05AM	Introduction of Topic and Agenda by chair
	Eline Boelee – Expert Advisor Water & Health, Deltares, Netherlands
11:05AM – 11:15AM	Brief Interactive Introduction of Participants
11:15AM – 11:30AM	Three Pitches
	Investments in Climate Resilience in Asia
	Maria Tran– Urban Development Specialist, Asian Development Bank, Philippines

	Cross Sectoral Collaboration in Practice
	• Dr Robert Bos – Independent Consultant, Switzerland
	Monitoring climate resilient WASH: The JMP/GLAAS Initiative
	• Bruce Gordon, World Health Organization (WHO), Switzerland
11:30AM – 11:40AM	Takeaways from Groupwork in First Session and Explanation of Discussion Themes
	• Jennifer de France – Technical Officer, World Health Organisation, Switzerland
11:40AM – 12:05PM	Group discussion
	A. Addressing Climate Resilience In Future Investments In WASH, Drainage, Waste Management
	B. Opportunities for Cross-Sector Collaboration
	C. Potential Health Benefits as Argument For the Mobilisation of Climate Funds For WASH
12:05PM – 12:20PM	Key takeaways from Each Group
12:20PM – 12:30PM	Summary and Wrap Up
	• Eline Boelee – Expert Advisor Water & Health, Deltares, Netherlands

17 June 2026 (Wednesday) | 4:00PM – 6:00PM | Room 7

Synopsis

Building on a long-established WHO-led history of poliovirus, the COVID-19 pandemic massively boosted the routine use of wastewater as an information source for SARS-CoV-2 in the population. Use cases included early warning of the introduction of an emerging pathogen, and an objective, simple, and non-invasive instrument supporting the public health response. Since the COVID-19 pandemic, the use of Wastewater and Environmental Surveillance (WES) has been explored for many other pathogens and antibiotic resistance. WHO has recently developed guidance for WES of respiratory viruses, antimicrobial resistance, arboviruses, measles/mumps/rubella, and hepatitis A and E virus, with a focus on feasibility, reliability, acceptability and added value for public health. Importantly, opportunities for multi-pathogen WES programmes are considered. WES for these pathogens is new and in most cases only at proof-of-concept stage, with studies in several countries having shown the strengths and limitations of WES. For many of these pathogens these proof-of-concept studies have shown added value for public health, particularly to make pathogen circulation under the radar of conventional health surveillance visible. This is relevant for pathogen outbreak response (agile WES), for routine disease surveillance and for pandemic preparedness. The objective of this workshop is to review examples of the value of WES for other pathogens than SARS-CoV-2 and poliovirus and discuss the best next steps towards further implementation of multi/other pathogen WES.

Programme

4:00PM – 4:10PM	Opening & Welcome
	Co-chair: Bruce Gordon - Unit Head of Water, Sanitation, Hygiene and Health, World Health Organisation, Switzerland
	Co-chair: Gertjan Medema - Principle Microbiologist, KWR Water Research Institute, Netherlands
4:10PM – 4:20PM	WHO Guidance Development On Multi-Pathogen WES
	Daniel Deere - Consultant for World Health Organisation, Australia
4:20PM – 4:30PM	Wastewater Surveillance for Early Pathogen Detection in Asia
	Vincent Pang - Assistant Professor, Centre for Outbreak Preparedness, DUKE NUS, Singapore
4:30PM – 4:40PM	Public health value of WES for Arboviruses 1: Zika virus outbreak in Singapore
	Shuzhen Sim – Director, National Environment Agency, Singapore
	Benjamin Lee - Scientist, National Environment Agency, Singapore
4:40PM – 4:50PM	Public health value of WES for Arboviruses 2: Japanese Encephalitis Virus in South Australia
	David Cunliffe, - Principal Water Quality Adviser, SA Health, Australia
4:50PM – 5:00PM	Public health value of WES of Measles and Mumps
	Gertjan Medema – Principle Microbiologist, KWR Water Research Institute, Netherlands
5:00PM – 5:10PM	Public health value of WES for MPOX: Low Resource Settings
	Daisuke Sano – Professor, Tohoku University, Japan
5:10PM – 5:20PM	Public health value of WES for Typhoid in Indonesia (Video presentation)
	Vicka Oktaria – Professor, Universitas Gadjah Mada, Indonesia
5:20PM – 5:50PM	Facilitated Discussion: Best next steps for implementation of WES, Both in high and low resource settings
	Co-chair: Bruce Gordon - Unit Head of Water, Sanitation, Hygiene and Health, World Health Organisation, Switzerland
	Co-chair: Gertjan Medema – Principle Microbiologist, KWR Water Research Institute, Netherlands
5:50PM – 6:00PM	Wrap up: Key Take aways
	Co-chair: Bruce Gordon - Unit Head of Water, Sanitation, Hygiene and Health, World Health Organisation, Switzerland
	Co-chair: Gertjan Medema – Principle Microbiologist, KWR Water Research Institute, Netherlands

18 June 2026 (Thursday) | 11:00AM - 12:30PM | Room 2

Synopsis

This interactive workshop explores the critical role of robust costing and financing approaches for delivering climate resilient sanitation. Drawing on recent life-cycle costing studies and regional WASH financing analysis, the session examines what investment is needed, by whom, and why sanitation continues to be overlooked in climate finance. Participants will engage with practical evidence, real-world financing experiences, and interactive discussions to identify pathways to close the sanitation finance gap and strengthen climate-resilient sanitation systems.

Programme

11:00AM – 11:10AM	Welcome and Opening Activity (With Polling)
	Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
11:10AM – 11:20AM	Scene-setting: The Climate-Resilient Sanitation Finance Dilemma
	Overview of global financing needs, available finance, limitations of project-based approaches and need to move towards systems strengthening investments.
	Juliet Willetts – Professor, Institute for Sustainable Futures, University of Technology Sydney, Australia
11:20AM – 11:30AM	Evidence from Recent research and Practice
	Life-cycle costing evidence from Lao PDR, Bangladesh and Solomon Islands. Regional financing analysis from East Asia
	Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
11:30AM – 11:55PM	Interactive small-group discussions
	A moderated conversation exploring the practical realities of financing climate-resilient sanitation across different contexts. Panellists will reflect on how public finance, climate finance, private capital and innovative mechanisms interact; the trade-offs involved in different financing models; and how evidence, risk allocation and institutional arrangements shape what is feasible and equitable. The discussion will focus on lessons from real-world experience and what can be done differently to better align finance with long-term, inclusive, resilient sanitation outcomes.
	Alex Grumbley – Country Director, SNV, Mozambique
	Lieven Jacquemy – Head of Southeast Asia for Private Equity and Infrastructure, Singapore
	Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
	Juliet Willetts – Professor, Institute for Sustainable Futures, University of Technology Sydney, Australia
11:55PM – 12:25PM	Panel discussion: Navigating the complexity of financing climate-resilient sanitation
	Exploring context-specific financing models and strengthening the climate rationale for sanitation investments
	Moderated by: Juliet Willetts – Professor, Institute for Sustainable Futures, University of Technology Sydney, Australia
	Bapon Shm Fakhruddin – Country Director, Green
	Saniya Niska – Water Sector Lead, SNV, Indonesia
	Irma Magdalena Setiono – Senior Water Supply and Sanitation Specialist, World Bankm Indonesia
	Aleem Remtula - Managing Director, WaterEquity, United States
12:00PM – 12:30PM	Wrap up and Close
	Actionable insights for addressing finance challenges and supporting climate-resilient sanitation systems
	Alex Grumbley – Country Director, SNV, Mozambique

15 June 2026 (Monday) | 9:00AM - 12:30PM | Room 6

Synopsis

Water utilities around the world are determined to achieve net-zero emissions. Nitrous oxide (N₂O) emissions represents the dominant source (>80%) of direct greenhouse gas (GHG) emissions of wastewater treatment plants. Reliable monitoring and quantification of N₂O from wastewater treatment plants and is therefore foundational to credible emissions reporting, performance benchmarking, and effective mitigation planning across the sector. While many international (IPCC) and national guidelines have established regulations for reporting N₂O emissions, the wastewater sector currently lacks a widely recognized, standardised monitoring and quantification approach that can be consistently applied across utilities, treatment configurations, and regulatory contexts. This gap limits data comparability, slows collective learning, and constrains coordinated sector-wide action on emissions reduction.

This workshop will present the key outcomes from the project and directly supports GWRC’s mission to deliver globally relevant, implementable guidance. By consolidating international expertise and experience on N₂O emissions from wastewater treatment plants, the workshop will introduce interim good-practice monitoring and quantification methodologies that enable utilities to generate comparable and decision-relevant data. Through the launch of a shared protocol and a facilitated panel discussion, the workshop will explore pathways toward sector-wide reporting, data harmonisation, and coordinated emissions reduction strategies, supporting a transition from fragmented local efforts to collective, system-level decarbonisation of the wastewater sector.

Programme

Session 1: (Launch of protocol) Global Collaboration Efforts on N₂O Monitoring

Chair: Stephanie Rinck-Pfeiffer (Global Water Research Coalition)

9:00AM – 9:05AM	Opening Remarks
	Gurdev Singh - Chief Engineering and Technology Officer, PUB Singapore's National Water Agency, Singapore
9:05AM – 9:25AM	Introduction to the N ₂ O Protocol Development & Content
	Prof Liu Ye – Professor, The University of Queensland (UQ), Australia
9:25AM – 9:55AM	Global Case Studies Presentations (10 mins each)
	Yangshuo Gu – Principle Specialist, PUB Singapore's National Water Agency, Singapore
	Dr Nerina Di Lorenzo – CEO, Melbourne Water, Australia
	Dr Bob Stear - Chief Engineer, Severn Trent Plc, UK
9:55AM – 10:30AM	Q&A
	Facilitator: Stephanie Rinck-Pfeiffer – Managing Director, Global Water Research Coalition, United States
10:30AM – 11:00AM	Coffee Break

Session 2: (Panel discussion) Moving toward sector-wide reporting and emission reduction to be facilitated by

Chair: Adam Lovell (CEO, Water Services Association of Australia)

11:00AM – 11:10AM	Opening Remarks & Scene Setting
	Adam Lovell - Executive Director, Water Services Association of Australia (WSAA), Australia
11:10AM – 12:00PM	Panel Discussion
	Dr Nerina Di Lorenzo – CEO, Melbourne Water, Australia
	Emma Shen – Global Principal for Wastewater Energy Optimization & Sector Decarbonization, Jacobs, Canada
	Dr Bob Stear - Chief Engineer, Severn Trent Plc, UK
	Gurdev Singh - Chief Engineering and Technology Officer, PUB Singapore's National Water Agency, Singapore
	Peter Grevatt – CEO, Global Water Research Coalition, United States
12:00PM – 12:30PM	Q&A
	Facilitated by Adam Lovell - Executive Director, Water Services Association of Australia (WSAA), Australia

16 June 2026 (Tuesday) | 4:00PM - 5:30PM | Room 6

Synopsis

Over the past decade, net zero commitments have become widespread across the global water sector. Utilities have announced ambitious targets, launched pilot projects, and invested in energy efficiency, renewable energy, and resource recovery initiatives. Yet despite this activity, sector-wide emissions reductions remain uneven, and in many regions progress appears to have slowed.

At the same time, the urgency of climate action has not diminished with both UNSDG13 and 6 behind target. Water utilities remain energy-intensive, asset-heavy organisations at the frontline of climate adaptation and mitigation. There is a recognition that net zero cannot be achieved through incremental optimisation alone, and that it requires system-level thinking, new operating models, and clearer pathways from commitment to execution. What’s emerging is not a lack of ambition, but a need to move from commitment to coordinated delivery at scale.

This workshop responds to a critical question facing the sector:

Has net zero for water utilities lost momentum—and if so, how do we regain it in a credible, practical, and regionally appropriate way? What needs to change, both practically and systemically, to accelerate progress?

Programme

4:00PM – 4:10PM	Welcome Remarks
	Lucy Thomas - Chief Scientist, RSK , United Kingdom
4:10PM – 4:20PM	Global Perspectives On The Decarbonisation Landscape
	Wilbert Menkveld - CTO, Nijhuis SAUR Industries, Netherlands
	Ryan Tan - Head of Catalytic Capital for Climate and Health, Temasek Trust
4:20PM – 4:40PM	Moderated Dialogue
4:40PM – 4:55PM	The Work Goes On: Utilities – Key Priorities Over the Next 3-5 years / How Will We Fix The Issues
	Andre Struker- Executive Board, AGV and Dutch Association of Water Authorities, Netherlands
	David Bergmann – CEO, Water Research Australia, Australia
	Yunita Tan – Chief Specialist, PUB, Singapore’s National Water Agency
4:55PM – 5:20PM	Moderated Dialogue
5:20PM – 5:30PM	Conclusion and Wrap Up by Moderator

18 June 2026 (Thursday) | 9:00AM - 10:30AM | Room 4

Synopsis

Circular economy and nexus ideas have already reshaped parts of the water sector – helping cut emissions, recover resources, and restore ecosystems. These successes relied on people and organisations working across boundaries: connecting policy, technology, and practice, and making the case for integrated solutions. Expanding impact now means tackling the deeper structures that hold silos in place including competing policy objectives, fragmented governance, and short-term incentives.

This workshop takes a systems view and asks: where are the leverage points that can unlock bigger shifts? Where can targeted, coordinated action – whether in policy, data systems, technology, financing, or community engagement – drive impacts across water, energy, food, and nature? Through a mix of panel insights and interactive mapping, we’ll explore: social equity payoffs; overcoming policy and regulatory silos, how shared data platforms can help scale solutions, and shifting narratives to enable integration.

Join us to identify practical leverage points and chart pathways for systems change, to expand circularity and nexus in water.

Programme

9:00AM – 9:10AM	Welcome Remarks
	Joanne Chong - Commissioner, Productivity Commission, Australia
9:10AM – 9:30AM	Provocations
	Moderated by Joanne Chong - Commissioner, Productivity Commission, Australia
	Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
	Carlo Alberto Amadei – Water Specialist, World Bank Group, United States
	Meena Yadav – Consultant, Isle Utilities, Australia
9:30AM – 10:10AM	Group roundtable discussions and identifying leverage points
	Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
	Joanne Chong - Commissioner, Productivity Commission, Australia
10:10AM – 10:30AM	Lightning Round
	Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia

18 June 2026 (Thursday) | 11:00AM - 12:30PM | Room 4

Synopsis

The global water sector is at a critical inflection point. Traditional linear models—extract, use, discharge—are no longer sustainable in the face of climate change, population growth, and resource scarcity.

This workshop will convene leaders from utilities, industry, academia, water associations and technology providers to accelerate the circular water economy through WEF’s Reduce–Recover–Regenerate framework. This workshop will explore how cross-sector collaboration can accelerate the transition to a Circular Water Economy, leveraging WEF’s Reduce–Recover–Regenerate framework to drive innovation and resilience. Participants will learn from real-world examples and engage in solutions-oriented discussions and collaborative design sprints. Outputs from this workshop will inform joint projects, investment strategies, and policy dialogues beyond the conference. Key insights and commitments will be shared through post-event reports, WEF and EESS networks, and digital platforms to catalyze global adoption of circular water practices.

Programme

11:00AM – 11:10AM	Opening & Workshop
	Chair: Keith Hobson - President, Water Environment Federation (WEF), United States
	Co-Chair 1: Laila Sukkariyyah – Director Global Programs, Water Environment Federation (WEF), United States
	Co-Chair 2: Prof. Hu Jiangyong - Group Head (Environmental and Sustainability), Director of the Centre for Water Research, Director, Environmental and Sustainability Engineering Programme, National University of Singapore, Singapore
11:10AM – 11:40AM	Circular Water Economy 101 Intro and Fireside Chat Panel Discussion
	Prof. Hu Jiangyong - Group Head (Environmental and Sustainability), Director of the Centre for Water Research, Director, Environmental and Sustainability Engineering Programme, National University of Singapore, Singapore
	Sungpyo Kim – CEO, K-AD, Korea
	Lucia Gusmaroli – European Projects Area Manager , Catalan Water Partnership (CWP), Europe
	Keith Hobson - President, Water Environment Federation (WEF), United States
	Junhong Shan – Lead Specialistic, PUB Singapore's National Water Agency, Singapore
	Wenlong Wang - Associate Professor , Tsinghua University, China
	Daisuke Sano – Professor, Tohoku University, Japan
11:40AM – 12:20PM	Interactive Design Sprint
12:20PM – 12:30PM	Concluding Fireside Chat Panelists Remarks/Observations
	Laila Sukkariyyah – Director Global Programs, Water Environment Federation (WEF), United States

17 June 2026 (Wednesday) | 9:00AM - 10:30AM | Room 6

Synopsis

The exponential growth of global data volumes—driven by social media, streaming, and AI—has led to a rapid expansion of data centers worldwide. Besides consuming vast amounts of energy, the data centers also consume water – directly for cooling and indirectly through energy generation. Many regions in Asia Pacific are under water stress and data centers could intensify the demand for scarce water resources. Sustainability considerations, policy shifts and regulatory scrutiny are driving data centers to minimize their water footprint through the adoption of new cooling technologies. At the same time, water utilities in the region need large investment to meet SDG targets especially on for sanitation and wastewater treatment.

By bringing together the key stakeholders – hyperscalers, data center operators, water utilities and regulator – this session poses a key question – can we develop a win-win solution for wider adoption of treated wastewater for data center cooling demand?. What would be the policy and regulatory enablers that can help align the interests of all stakeholders. What would the financing model look like and what would be the next steps in this direction.

Programme

9:00AM – 9:10AM	Welcome Remarks
	Vikram Kumar - Regional Industry Director, Infrastructure, Asia Pacific, International Finance Corporation, World Bank Group
9:10AM – 9:20AM	Data Centers in Emerging Markets : Challenges and Opportunities
	Serene Ho - Senior Digital Specialist, Digital Vice Presidency, World Bank Group, Singapore
9:20AM – 10:10AM	Moderated Panel Discussion
	Moderated by Victoria Delmon – Manager, Upstream and Advisory, Infrastructure, Asia Pacific, I International Finance Corporation, World Bank Group
	Serene Ho – Senior Digital Specialist, Digital Vice Presidency, Malaysia
	Anthony Giovannone – Manager, Utility Infrastructure Strategy, Google, United States
	Gunalan Kanasan – Water Infrastructure Manager, AWS Data Centers, Singapore
	Ir Lee Chin Shyan – Sr. Director SPAN, Malaysia
	Calvin Ng – Water Infrastructure Manager, Air Trunk, Singapore
10:10AM – 10:30AM	Q&A with Audience

THEME 1 : WATER NETWORK	
	[TS1.1] SEEING THE INVISIBLE: NEXT GENERATION LEAK DETECTION AT SCALE 15 June 2026 (Monday) 9:00AM – 10:30AM Room 1
	Session Chairs: Zdravka <u>Do Quang</u> , SUEZ (France), Guohao <u>Lim</u> , PUB, Singapore's National Water Agency (Singapore)
>	Still Leaking After All These Years: Insights from Two Decades of Water Transmission Pipeline Inspection
	Eric <u>Toffin</u>, Xylem (United States)
	Effective management of large-diameter water transmission pipelines is a growing global priority, as utilities seek to reduce non-revenue water (NRW), extend asset life, and improve system resilience. The International Water Association has emphasized the importance of proactive leak detection and condition assessment as essential components of sustainable water infrastructure strategies. Leaks on large-diameter pipelines are particularly critical—not only because they are typically hidden and difficult to detect, but also because they often follow a “leak before burst” failure mode, where small, undetected leaks can escalate into catastrophic failures. These leaks are a major contributor to NRW and can persist unnoticed for years, especially in remote or buried infrastructure. Over the past two decades, inline acoustic technologies have enabled utilities around the world to detect and locate these hidden leaks with precision, transforming how large-diameter metallic pipelines are monitored and managed. This paper presents key observations from 20 years of inspections, offering a global dataset-driven perspective on leak prevalence, material-specific performance, and the evolving role of proactive leak detection - enhanced by the latest innovations in sensor technology and data analytics—in long-term asset management.
>	IAcoustic: AI-Powered Acoustic Sensing for leak early detection and Integrating Physical Inspections and AI-Enhanced Data Analysis for Improved Asset Management and Strategic Decision-Making: A Case Study of ETRA Spa Società Benefit in Northern Italy
	Pierre <u>Bonardet</u>, SUEZ (France)
	The IAcoustic project is a comprehensive expertise program led by SUEZ to improve leak detection through the use of acoustic measurements. Launched in 2024, the project is structured around two complementary modules: IAcoustic “Placement”: focuses on optimizing the positioning and coverage of leak detection acoustic sensors, minimizing the number of devices required, and prioritizing listening zones to maximize detection rates. IAcoustic “Analysis”: aims to reduce leak detection time and false positive rate by processing acoustic signal data from sensors through AI-based analysis. This module uses supervised learning on a curated and ground trusted labeled database of acoustic signals, taking advantage of SUEZ operational print. The deterioration of water infrastructure in Italy, compounded by historical underinvestment, highlights the urgent need for data-driven asset management. This study presents a comprehensive methodology applied by SUEZ Italy in collaboration with ETRA SpA SB, integrating pipe inspections, soil and water analyses, and AI-enhanced risk modelling to optimize renewal planning over a 5,400 km network. Combining physical diagnostics with digital tools -including likelihood and consequence of failure assessments, participatory workshops, and multi-criteria optimization- the approach improves decision-making under budget constraints. Early results demonstrate enhanced targeting of high-risk segments and increased infrastructure resilience, supporting strategic investments aligned with Italy's PNRR modernization goals.
>	Optical Fiber-Based Acoustic Sensing for Flow Velocity Estimation in Water Pipelines
	Panagiotis <u>Pentaliotis</u>, LWF Corp (United Kingdom)
	Flow velocity is a key parameter in monitoring water-filled pipelines. This paper presents a technique based on an optical fiber distributed acoustic interrogator for estimating flow velocity in live water pipes. The method is demonstrated on a ~20 km live horizontal water pipe. Flow velocity is inferred from the Doppler shift between upstream- and downstream-propagating acoustic modes, visible as dispersion branches in the 2D Fast Fourier Transform (2D-FFT) domain. A novel flow-velocity detection algorithm is introduced that identifies the acoustic velocity using the dominant power distributions in the 2D-FFT domain with high accuracy. The paper distinguishes and addresses three main challenges: Selecting pipe sections that reliably and consistently produce dispersion branches within our horizontal live pipe system. Normalizing and filtering the data to enhance the dispersion branch visibility to monitor a 24/7 water pipe. Lastly, estimating acoustic velocity angles with maximum accuracy. The results showcase the clarity of the obtained acoustic signals in the 2D-FFT domain from the correct selection of pipe sections, the data normalization and filtering techniques. Finally, the novel peak detection algorithm presents its strength and success tested against a well know line detection algorithm.
>	Innovative Leak Detection in Water Supply Systems: Combining Algorithms, Field Expertise and Open-Platform Integration
	Guido <u>Vaes</u>, Hydroscan (Belgium)
	Leakage in drinking water networks remains a major challenge, as traditional acoustic surveys and wide-area inspections are labour-intensive. HydroScan’s LeakRedux® algorithm improves this process by real-time detection of leakages in DMAs and prioritization for leak search, directing utilities to areas with the greatest cost–benefit gain. At Hawacom in Hanoi, LeakRedux® has markedly increased operational efficiency: field teams now use algorithmic priority lists to target inspections, apply subsectioning to isolate leak areas down to street level, and confirm leaks more quickly with fewer wasted hours. This combined digital–operational workflow has reduced field workload, accelerated leak confirmation, and contributed to lowering Hawacom’s leak rate from 17.5% (2019) to 14.25% (2023). Integrated into the NRWCOCKPIT Localize module, LeakRedux® can work alongside acoustic data, remote sensing, and AI-based leak localisation methods, giving operators a unified overview of leak probabilities. The approach offers a scalable model for efficient leak management worldwide.

	[TS1.2] FROM REACTIVE TO PROACTIVE: SECURING WATER OPERATIONS IN A DIGITAL AGE 16 June 2026 (Tuesday) 2:00PM – 3:30PM Room 2
	Session Chair: <i>Kai Cheong <u>Lai</u></i> , PUB, Singapore's National Water Agency (Singapore), <i>Arielle <u>Huang</u></i> , PUB, Singapore's National Water Agency (Singapore)
>	Advancing Network Intelligence Scalable Smart Water Analytics with Predictive and Diagnostic Capabilities
	<i>Olivier <u>Pison</u></i>, SUEZ (Singapore)
	PUB, Singapore's National Water Agency, is evolving its Smart Water Grid Analytics Platform to support predictive network management to anticipate service risks and plan interventions more efficiently. Following a major technology refresh in 2025, PUB has developed a state-of-the-art digital twin of Singapore's drinking water network, powered by extensive real-time sensor data and a regularly recalibrated hydraulic model. The platform now integrates discolouration risk mapping, pressure dip diagnostics, and water injection modelling to optimize network performance in addition to existing capabilities such as optimizing pipe replacement work, reduction in water service disruptions. In addition, new anomaly detection capabilities with user customizable thresholds and Machine learning model embedded, alert handling, and surge analysis visualisations provide PUB officers with real-time, actionable insights on detecting anomalies, correlating network events and minimize false positives. Thereby reducing field investigation times, improving operational efficiency, and enhancing customer confidence in the water quality.
>	Securing our Critical Water Infrastructure against Cyber Attacks
	<i>Sunil <u>Sharma</u></i>, GHD Pty Ltd (Australia)
	Water systems are vital for supporting human life and the economy, providing essential services such as drinking water, sanitation, irrigation, and power generation. These systems are highly complex, incorporating components like pumps, valves, sensors, and control systems, and are often managed remotely using advanced technologies. However, the adoption of digital monitoring and control introduces significant vulnerabilities, making water infrastructure susceptible to cyber-attacks, including ransomware, denial-of-service, and phishing. In 2022, there was a dramatic increase in malicious cyber techniques targeting water systems, emphasising the urgent need for robust cybersecurity measures. Despite the sector's importance and ongoing government efforts to promote voluntary cybersecurity improvements, progress remains slow, and many water systems lack adequate protection. As threats escalate, strengthening cybersecurity programs is critical to safeguarding public health, environmental quality, and economic stability. This paper examines the evolving cybersecurity challenges facing water systems and identifies strategies to enhance their security and resilience.
>	Cured-In-Place Pipe (CIPP) Rehabilitation of Water Mains in Singapore
	<i>Ivy <u>Carreon</u></i>, Jacobs (Singapore)
	Singapore's underground space gets increasingly congested due to the continuous infrastructure developments, it is becoming more challenging to carry out pipeline replacement works, especially for transmission pipelines. Therefore, more innovative technologies are being explored for pipe renewal. The cured-in-place pipe (CIPP) method was implemented for the rehabilitation of ageing water pressure mains in Singapore to improve the structural integrity and hydraulic performance of the ageing watermains. The CIPP method is a trenchless method where only two excavation pits are required for pipe access for rehabilitation, greatly minimising the impact on the public and the environment. This paper covers the CIPP method adopted to renew watermains within the congested city area.

	[TS1.3] KEEPING WATER SAFE IN DISTRIBUTION NETWORKS 16 June 2026 (Tuesday) 4:00PM – 5:30PM Room 2
	Session Chairs: <i>Amir <u>Cahn</u></i> , SWAN (United Kingdom), <i>Liyan <u>Li</u></i> , National University of Singapore (Singapore)
>	A Rapid And Low-Cost Colorimetric Dip-Strip Kit For Real-Time Microbial Monitoring
	<i>Jyoti <u>Gautam</u></i>, Indian Institute Of Technology, Jodhpur (India)
	The safe use of drinking water as a means of maintaining public health is dependent upon the effectiveness of monitoring to eliminate or minimize bacterial contamination. To address this need, we have developed a colorimetric paper strip dip (PSD) test for the quantitative determination of bacterial contamination. This PSD test utilizes dye-coated paper strips which undergo the Fenton reaction when placed into a mixture of deionized (DI) water and hydrogen peroxide (H₂O₂). When the bacterial catalase in contaminated water reacts with hydrogen peroxide, it competes with the Fenton catalyst for hydrogen peroxide. The result is a visual indication of the color change on both the paper strip and the surrounding liquid. The degree of color change on the paper strip/liquid can be used to determine the level of bacterial contamination in the water sample. Our method has demonstrated a detection limit of 50 CFU/ml for catalase positive bacteria (e.g., <i>Escherichia coli</i>) within 5 minutes at room temperature (25 °C). The test has also demonstrated little to no interference from other potentially contaminating substances found in surface waters. In addition to being a rapid, accurate, and cost-effective (~\$0.06 USD/test) tool for detecting bacterial contamination in drinking water, the test can be integrated with a mobile app for easy and reliable quantification of bacterial contamination. The mobile app will provide recommendations regarding chlorination requirements for disinfecting contaminated water samples. Therefore, the PSD test is a fast, accurate, highly specific, low-cost, and easy-to-use tool for on-site determination of bacterial contamination in drinking water sources.
>	Disinfection-Driven Oxidation of Polymer Pipes and The Effects on Distributed Water Quality
	<i>Mohammad <u>Tarig</u></i>, Hamad Bin Khalifa University (Qatar)
	Maintaining biological stability within drinking water distribution networks (DWDS) presents a significant challenge, necessitating continuous and spatially resolved monitoring of microbial dynamics. Automated flow cytometry (FCM) provides rapid approach for monitoring and assessing bacteriological water quality within DWDS by quantifying bulk microbial community abundance, assessing cell viability, while detecting shifts in community composition through fluorescence-based fingerprints. This study analysed the FCM-derived Intact Cell Count (ICC) measurements from Verbier network (Switzerland) to determine microbial trends and their potential associations with environmental factors. Analyses showed minimal correlation between ICC and weather variables, indicating that ICC alone reflect limited fraction of the complex microbial dynamics. ICC provides a direct evaluation of microbial load; however, it is constrained in identifying alterations in community structure and anomalies that may precede instances of biological instability. These findings necessitating combining the ICC data with advanced methods as Microbial Community Change Detection (MCCD) and fingerprinting to improve microbial water quality assessment.
>	Simulation of residential water distribution network for managing chlorine decay using smart water meter data
	<i>Ngoc Minh <u>Nguyen</u></i>, Toyohashi University of Technology (Japan)
	Chlorine decay is a challenge for disinfection in water distribution network. Simulating chlorine decay using smart water meter data presents an opportunity to optimize chlorination and improve water safety. This study focuses on a network with low initial chlorine concentrations, which may lead to a faster decay of chlorine level and less effective disinfection. Chlorine decay was simulated in the water distribution network of Chibata district in Kosai City, Shizuoka Prefecture, Japan, where free residual chlorine is maintained at 0.1–0.4 mg/L. The interface simulation of chlorine behaviour in response to water consumption fluctuation demonstrated how smart meter data can enhance chlorine management in water distribution networks to reduce microbial contamination risks.

	[TS1.4] PEOPLE IN CHANGE: THE MISSING MIDDLE OF SMART WATER 17 June 2026 (Wednesday) 9:00AM – 10:30AM Room 1
	Session Chairs: <i>Tertius Rust</i> , The Innovation Consulting Company (South Africa)
>	Measuring and Strengthening Innovation Team Climates with the Explorer Index®
	<i>Phil Buckingham</i>, Anglian Water Services (United Kingdom)
	Innovation in water utilities depends not only on technology but also on creating team climates that foster exploration, collaboration, and adaptability. The Explorer Index® (EI), co-developed by Anglian Water and The Innovation Consulting Company (TICC), is an evidence-based tool designed to diagnose and strengthen such climates. Grounded in behavioural science and refined through four years of pilots and statistical analysis with over 250 participants, the EI measures team perceptions across four dimensions: Connected, Committed, Curious, and Confident. Rigorous testing improved clarity, reduced bias, and streamlined the tool to provide actionable insights. Results show that teams with lower scores in any of the four dimensions adopted targeted interventions, from micro-habits, collaborative nudges to inquiry-driven workshops, strengthening their capacity to innovate. Embedding EI insights into sponsor-led programmes has accelerated climate change, reinforced trust, and enabled scaling of innovation adoption. The EI provides a practical framework to bridge technological progress with the human dimension required for sustainable water networks.
>	Psychological Capital as an Activator of Career Adaptability to Support Workforce Continuity Planning in Water Resources Management
	<i>Beta Hakim</i>, Jasa Tirta I Public Corporation (Indonesia)
	In the field of water resources management, the high level of uncertainty requires workforce continuity planning to be crucial. Changes in regulations, business processes, and water availability pose challenges for companies in their business continuity. Jasa Tirta 1 Public Corporation as a water resources management company with employees who have various educational backgrounds and more than 30% of employees who hold positions outside their formal education, 66.6% of employees with high school education and 70% of the total employees with technical education backgrounds certainly really need employees with career adaptability skills to support operations in water resources management. certainly really needs employees with career adaptability skills to support operations in water resources management. This study aims to ensure that indicators for selecting the right talent during recruitment are key to a company's success in adapting to changing times. Psychological Capital and Career Adaptability serve as frameworks used to predict employee performance and ability to face future changes. Dimensions of Psychological Capital: self-efficacy, hope, optimism, and resilience, act as activators of career adaptability, which ultimately leads to workforce performance. Therefore, it can be concluded that these dimensions play a crucial role in the employee recruitment process in the water resources management sector in addressing future challenges.
>	The Digital Transformation Journey of Canal de Isabel II. Organisational and Human Challenges in Achieving Full Digitalisation
	<i>F. Javier Fernandez</i>, Canal de Isabel II (Spain)
	This abstract presents a comprehensive account of the digital transformation undertaken by Canal de Isabel II, tracing its evolution from traditional manual operations to a fully digital management paradigm. With a distinguished history spanning 175 years, the company has consistently surmounted numerous challenges, always leveraging the most advanced technologies available. The imperative to enhance operational efficiency, ensure regulatory compliance, and improve service reliability has driven the adoption of digital systems, culminating in the establishment of a centralised control centre as the pinnacle of this process. Nevertheless, this technological advancement has not been without its difficulties. Organisational obstacles have arisen, including resistance to change, the necessity for new skill sets, and the redefinition of roles and responsibilities. The most significant challenges have pertained to personnel: concerns regarding job security, adaptation to new digital tools, and the transformation of workplace culture. Sustained engagement, transparent communication, and targeted training programmes have proved indispensable in overcoming these barriers, enabling staff to embrace the digital future. At present, Canal de Isabel II is embarking upon a pivotal initiative to promote digital transformation throughout the organisation. This endeavour entails a thorough review of the company's process map, with the objective of designing appropriate modifications to fully exploit state-of-the-art digital technologies. This session will share lessons learned, highlight best practices for managing organisational and human factors, and explore how the digital transformation strategy is positioning the company to attain higher levels of operational excellence and innovation. Canal de Isabel II is the public utility responsible for managing the entire water cycle in the Madrid region, serving seven million people across 179 municipalities.
>	Use of a Generative AI Assistant & A Knowledge Twin to Improve Asset Maintenance Efficiency
	<i>Mogan Padayachee</i>, Rand Water (South Africa)
	Rand Water, one of South Africa's leading bulk water utilities, is undertaking a digital transformation to address ongoing inefficiencies in asset maintenance and management. This pilot project, led by TeamSolve in partnership with Empire Partner Foundation (EPF) as its local collaborator, will implement a revolutionary Knowledge Twin serving as an AI Assistant. It is a generative AI-driven solution designed to boost operational efficiency, improve safety, and empower the workforce with real-time knowledge and insights. The initiative supports Rand Water's strategic goals of promoting innovation and providing sustainable, resilient service. TeamSolve Pte Ltd, an AI technology startup founded in January 2022 and based in Singapore, is leading the effort. This preliminary pilot project report presents the initial strategic framework for a digital pilot project designed to revolutionize asset maintenance and operational processes at Rand Water by implementing a generative AI-powered Digital Assistant, also known as a Knowledge Twin (KT). The pilot project aims to address major inefficiencies in asset management by improving access to knowledge, operational consistency, and workforce skills. By implementing KT, an AI Assistant, Rand Water plans to develop a digitally skilled workforce capable of obtaining real-time insights, improving operational safety, and greatly reducing downtime and associated costs. The pilot project began in January 2025 and will conclude in January 2026, with a detailed case study to follow.

	[TS1.5] MIRRORING WORLDS: THE RISE OF DIGITAL TWINS 17 June 2026 (Wednesday) 11:00AM – 12:30PM Room 1
	Session Chair: <i>Albert <u>Cho</u></i> , Xylem Inc. (USA), <i>Liyan Li</i> , National University of Singapore (Singapore)
>	Static Models to an Operational Digital Water Network Twin in a Medium-sized African City: Data Quality, Operational Rule Capture, and Early Operational Insights
	Alexander <u>Sinske</u> , GLS Consulting (South Africa)
	We present the development of an operational digital water network twin (DWN Twin) for George Municipality in South Africa. The twin couples a calibrated extended-period simulation (EPS) model with real-time telemetry, GIS layers, and warning thresholds on a cloud platform. Key challenges in a developing-region context included incomplete asset information, faulty or intermittent sensor data (negative/zero values, spikes, gaps), incomplete capture of daily operational rules, and the need for iterative calibration.
>	Development and Benefits of a Network Digital Twin for the City of Valencia, Spain
	Martin <u>Shaw</u> , Xylem (Malaysia)
	In 2005 the water supply operator for the City of Valencia, Spain embarked on an ambitious digital transformation journey. Faced with a number of challenges including water scarcity, aging workforce, increasing operational expenditure and a desire to deliver world class customer service, a commitment was made to embrace digital solutions to drive improved efficiencies. Starting with a smart meter roll out it was soon established that the customer consumption data could be utilized for more than just billing, however the use of multiple vendors and communication streams for the data created issues with data management. These issues were addressed by the development of a sensor agnostic smart water platform, which evolved over time to include many modular solutions including a highly accurate digital twin for the water supply network. The digital twin has since delivered numerous benefits including reduced NRW and Opex, reduced greenhouse gas emission and improved customer satisfaction.
>	From Diagnostic To Prescriptive Digital Twins: Using Ai And Ml For Advancing Hydraulic Models Of Water Networks
	Eland <u>Afuang</u> , Autodesk (Australia)
	Water utilities are increasingly adopting digital twins of their water, sewer, and drainage networks, yet many remain diagnostic, providing insight without guiding how to efficiently operate or invest in assets. This paper demonstrates how artificial intelligence (AI) and machine learning (ML) can advance such twins towards prescriptive analytics for capacity-based asset management and operational modelling through two complementary use cases. In the first use case, AI assisted scripting automates core hydraulic modelling workflows in a water distribution twin, embedding best practice checks, systematically generate scenarios and produce consistent key performance indicators to support operational and asset decisions. In the second use case, catchment specific surrogate ML models are trained using outputs from hydrodynamic simulations to approximate flows, levels, and overflows at locations of interest, enabling much quicker evaluation of multiple rainfall and operational scenarios without the time consuming of running full dynamic simulations. Together, these approaches expand scenario coverage, reduce analysis effort, and provide timely, and model informed recommendations that support operational insight and targeted investment in water network assets.
>	High Fidelity Digital Twin-Enabled Near Real Time Anomaly Detection and Localization for Multi-Scale Water Networks in Singapore, Europe and North America and Integrating AMI Analytics with Digital Twin for Small Leaks Detection and Localization
	Alvin <u>Chew</u> , Bentley Systems (Singapore)
	This abstract consolidates the key outcomes from deploying the Anomaly Leak Finder (ALF), a high-fidelity digital twin (DT) technology, across three leading water utilities in Singapore, Europe and USA. Till date, the pilot testing of ALF spanned across water distribution networks which range from 55 km small districts to 1200 km transmission-distribution systems having flow and pressure instrumentation being deployed across the different water supply zones. Overall, ALF unifies short-horizon data-driven predictive modelling, continuous baseline hydraulic model calibration/updates, AMI-driven demand assignment where available, and anomaly localization via coupled hydraulic modelling and optimization analysis. Across the different utilities, ALF generated actionable localized anomaly hotspots, which can encompass on-spot to sub-kilometer search bands within the water networks, for assisting field operators to detect and localize hidden anomalies for reducing the network's non-revenue water. A systematic approach of Advanced Metering Infrastructure (AMI) data analysis is developed for enhancing digital twin fidelity, namely completeness and integrity of the entire WDN representation, for near real-time (NRT) detection and localization of the small leaks in WDNs. The proposed methodology has been integrated and implemented in a high-fidelity digital twin software solution. Field validation was carried out through three rounds of washout tests to emulate the small leaks in size of 100 L/min in a real WDN. The integration of AMI data analysis has led to a 50% reduction in mean absolute percentage error (MAPE) for pressure and flow compared to models relying on conventional monthly billing data, demonstrating a significant improvement in model accuracy. With AMI data analysis integration, the solution successfully detected and localized the emulated small leaks, highlighting the value and potential of using live AMI data to support near real-time detection and localization of small leaks.

[TS1.6] WALKING THROUGH THE DIGITAL DOOR TO AI-DOPTION 17 June 2026 (Wednesday) 4:00PM – 5:30PM Room 1	
	Session Chairs: <i>Martine <u>Watson</u></i> , Urban Utilities (Australia), Zhi Siong Ong, PUB, Singapore’s National Water Agency (Singapore)
>	Water Accelerator Testbeds: Demonstrating the Next Generation of Innovative Technology
	<i>Max <u>Herzog</u></i>, Cleveland Water Alliance (United States)
	Entering the US water market is tricky. With long sales cycles, low access to capital, and an understandably risk-averse client base, it is difficult for innovation from the lab or abroad to catch on. The result is often that new technologies fail at the “valley of death,” even when their solution is sorely needed. Cleveland Water Alliance, a global leader in facilitating the freshwater economy, is mobilizing over 300 industry-leading companies, research institutions, utilities, and agencies to tackle these challenges. Our approach centers the testing, evolution, and demonstration of new technologies through piloting. Tools such as a standardized intake process, legal infrastructure, insurance support, and partner vetting help derisk trials for innovators and end users. The secret sauce, however, is the network of testbed facilities and partners that enable access to a wide range of test sites, benchmarking data, and customer profiles. Cleveland Water Alliance has outfitted the Lake Erie Watershed with a state-of-the-art IoT monitoring infrastructure, making it the largest digitally connected freshwater body in the world. This network of sensors provides real-time data to industry, utility, agriculture, and government partners across the region, enabling robust solutions for monitoring ever-changing water conditions. This same network provides a platform for testing new technologies. Close collaboration with the stakeholders that leverage our data for their operational decision making, enables CWA to arrange field trials at water intakes, within treatment processes, in the environment, and beyond. These pilots not only enable real-world performance evaluation benchmarked by our sensor data, they ensure that solutions are developed with customer needs in mind. With 80+ trials from 13 countries completed to date, our waitlist for future deployments is growing rapidly. This presentation will cover success stories and lessons learned as well as inroads into industrial and agricultural markets.
>	Some Things Will Never Change: How Digital Technology Is Not Disrupting The Water Sector
	<i>Christine <u>Boyle</u></i>, Burnt Island Ventures (United States)
	When we think of scaling innovation and smart water, some utility staff see big red RISK headlines flashing. The prudent technologists and utility leaders however, understand that risk is an important part of progress and we can mitigate risks via controlling for the things in our water management systems that don’t change. For example, complying with local permit requirements, training people properly to do their jobs, including technology, and ensuring clean and affordable water for communities. This session will highlight “stories from the field” from the perspective of a water entrepreneur and investor based in the USA, Christine Boyle, a water technologist and entrepreneur based in Australia, Mudasser Iqbal of TeamSolve, and a water utility professional (TBD! Will seek a regional based utility leader). We will talk about how to derisk technological innovation and scaling so that the things that need to not change, don’t change, while gains in accuracy, efficiency, energy use and the like can improve. We will use examples from digitization including TeamSolve’s AI-enabled field services co-pilot with Yarra Valley Water, Christine’s data-driven meter management solution with Clayton County Water Authority and some more risky innovation types such as water treatment systems and direct potable reuse projects (based in Australia). The thread connecting this talk is a moment of truth that contrary to Silicon Valley notions of technological disruption (think Uber), water utilities do not want their core function to be radically disrupted. This frame of mind is very important for technologists to understand and explains why utilities often require pilots and lengthy implementation times. The sooner technologists realize this, the more aligned they will be with the values of their customers.
>	WaterSIM-Agentic: Towards Autonomous and Transparent Water and Wastewater Systems Modelling and Operations and AI Agents in Your Water Utility—A Powerful Co-Pilot or a Risky Takeover?
	<i>Dragan <u>Savic</u></i>, KWR Water Research Institute (Netherlands)
	Urban water and wastewater networks (UWWNs) rely on accurate modelling for effective management, but traditional tools like EPANET and SWMM require specialised knowledge and complex workflows, limiting their practical use. This study introduces WaterSIM-Agentic, a novel framework that integrates agentic artificial intelligence with water and wastewater simulation capabilities, enabling the control of hydraulic and water quality analysis through natural language. This represents a significant step toward the automation of model use for various planning and operational purposes. WaterSIM-Agentic uses an Orchestrator-based architecture that coordinates three specialised agents: TaskExecutor (task decomposition), CodeRunner (simulation execution), and DataAnalyzer (output interpretation). These agents operate through a nested, tool-driven design that ensures precise execution and transparent workflow management, while maintaining a human-in-the-loop structure for oversight in safety-critical contexts. The framework was tested on benchmark networks of various sizes, across four task categories: system characteristics, dynamics, operation, and scenario simulation. WaterSIM-Agentic achieved a 100% success rate in task completion and tool invocation, without requiring active human intervention. The DataAnalyzer agent provided detailed insights into simulation results, outperforming manual inspection, and the architecture demonstrated strong scalability and robustness. WaterSIM-Agentic represents a significant step toward autonomous, intelligent, and resilient urban water infrastructure management. Its modular design supports future extensions, offering a scalable solution for integrating AI into water infrastructure planning and operations. Water utilities, characterized by vast, complex infrastructures and a reliance on specialized engineers, face a critical management challenge exacerbated by the "silver tsunami" of retiring talent. This presentation addresses the potential of Agentic AI—AI capable of autonomous decision-making—to overcome these bottlenecks. The objective is to analyze the appropriate level of autonomy, revealing the strong industry consensus (90%) favoring a "human-in-the-loop" model where AI acts as a sophisticated co-pilot, not a replacement. We will detail the structure and function of a "digital team" of specialized agents (e.g., Data, Simulating, Orchestrating Agents) for focused infrastructure goals. Findings highlight that the primary value of Agentic AI lies in making recommendations for human approval and codifying expert knowledge to build workforce resilience. The conclusion is that Agentic AI's highest utility is in augmentation and expert knowledge transfer, securing operational efficiency without jeopardizing control.

>	Building Trust in AI for Water Utilities
	Thomas <u>Allen</u>, RSK Group (Singapore)
	Water utilities face increasing pressure to optimise processes, reduce operational costs, and improve reporting accuracy. The appeal of deploying artificial intelligence (AI) is strong, and the potential benefits are significant. However, unstructured or premature AI adoption introduces real risks: mild hallucinations at best, and serious misinterpretation or financial impact at worst. This challenge is intensified by growing concerns around data protection. Thousands of AI start-ups now promise transformational capabilities, but many rely on third-party models, subscription-based infrastructures, and opaque data-sharing agreements. These dependencies create exposure to escalating costs, unpredictable changes in model behaviour, and the potential extraction or leakage of sensitive operational data. RSK proposes a different model: transparent, privately, run, hybrid AI implementations. This approach enables utilities to adopt advanced analytical capabilities while protecting their data, maintaining accuracy, and ensuring long, term reliability. By combining deterministic statistical methods with controlled generative tools, utilities can build a sustainable, cost-controlled AI foundation that avoids hallucinations, preserves trust, and remains fully auditable.

THEME 2 : WATER TREATMENT

[TS2.1] ADVANCEMENT IN MEMBRANE TECHNOLOGY

15 June 2026 (Monday) | 9:00AM – 10:30AM | Room 2

Session Chairs:

Nikolay Voutchkov, Water Globe Consultants (Saudi Arabia)

> Innovation in Desalination – Where Might the Future Take Us?

***Nikolay Voutchkov*, Water Globe Consultants (United States)**

Today reverse osmosis is a well-established and mature technology. But it has its limitations in terms of energy use and cost of key desalination plant equipment and membranes. This presentation provides an introductory overview of the technological advancements in the next 5 years and 20 years that are expected to transform desalinated water into the lowest cost source of alternative water supply worldwide.

Driven by innovation, water scarcity, aridification, global warming pressures, and advancements in technology, desalination is outgrowing the rate of application of any other water technology over the last 10 years. The presentation focuses on the latest technological advancements that are expected to reduce the cost of desalination by 20% in the next 5 years including: creating a new generation of nanostructured membranes of significantly higher productivity and ability to adjust membrane performance in-situ and on demand; wider use of ceramic membranes for seawater pretreatment; extending the oxidation and biofouling resistance of membranes and their useful life; replacing most of the desalination plant steel equipment and piping with lower cost/lower weight plastic equipment and piping; automating plant monitoring and control to a level that allows remote unmanned plant operation, and development of joint desalination and brine valorization plants.

In addition, the presentation discusses the future technologies that can further reduce the cost of desalinated water by 80% in the next 20 years – including new energy recovery devices, new sources of energy derived from the brine; and complete circularity of the water production process by internal brine valorization for production of all chemicals used in the desalination process.

> Impact of Ferric Coagulation on Ceramic Membrane at Choa Chu Kang Waterworks (CCKWW)

***Clement Pierart*, PWNT (Netherlands)**

PWNT, PUB, Metawater, and NSI APAC conducted a joint pilot study to investigate the impact of ferric coagulated and clarified water to the performance of Ozone-CeraMac® system. The trials were performed at Choa Chu Kang Waterworks (CCKWW) from March 2023 to April 2025. It was found that iron concentration in clarified water plays a critical role in the performance of the downstream Ozone-CeraMac® process. The performance of ceramic membrane was found more stable at the flux of 360 l/mh when iron levels in membrane feed water were maintained below 0.8 mg/L, with backwash load 1000 L/m², and chemical enhanced load 4000 L/m². Under this condition, the Clean-in-place (CIP) interval could exceed 30 days before TMP hits CIP trigger setpoint 41.2 kPa (based on TMP increasing rate). CIPs with Metawater warranty chemicals (sodium hypochlorite and citric acid) could restore specific flux ≥1600 l/mh/bar after 7 rounds of CIP.

> Pre-treatment of highly challenging seawater by submerged ceramic ultrafiltration

***Olga Ferrer*, ACCIONA Agua S.A. (Spain)**

A 1.5 m³/h pilot plant equipped with CERAFILTEC ceramic submerged ultrafiltration (UF) membranes has been assessed as seawater reverse osmosis (SWRO) pre-treatment. The performance of the membranes has been evaluated both in hydraulic and quality terms, dealing with raw seawater from the Mediterranean Sea. In order to push the technology to its limit, different foulants have been spiked continuously to determine the system performance under highly challenging influent seawater (SW) conditions such as algae blooms (up to 85 Mcel/L) or high suspended solids scenarios (up to 80 ppm of total suspended solids (TSS)). Under the different scenarios addressed, the cleaning conditions have been optimized to maximize the water recovery and decrease the reagents consumption while maintaining a high permeability of the membranes.

	[TS2.2] BRINE VALORIZATION 15 June 2026 (Monday) 11:00AM – 12:30PM Room 2
	Session Chairs: <i>Nikolay <u>Voutchkov</u></i> , Water Globe Consultants (Saudi Arabia), <i>Wee Joon <u>Teo</u></i> , National University of Singapore (Singapore)
>	Turning Brine into Value: An open testbed for innovation and barrier removal
	<i>Angel Rivero <u>Falcon</u></i>, Instituto Tecnológico de Canarias (Spain)
	Water reuse and brine valorisation are becoming increasingly important for advancing sustainable and circular desalination practices worldwide. In this context, the Canary Islands Institute of Technology (ITC) has developed a Brine Valorisation Open Testbed within the DESAL+ Living Lab platform in Gran Canaria, Spain. This platform provides a real-world environment for validating innovative desalination and brine treatment technologies under operational conditions using different brine streams and flexible pilot-scale infrastructure. Recent developments include advanced Nanofiltration (NF) and Osmotically Assisted Reverse Osmosis (OARO) pilot systems incorporating energy recovery devices and enhanced monitoring tools. In parallel, collaborative initiatives with innovative start-ups are exploring electrochemical brine treatment and CO2 capture processes as emerging pathways for resource recovery and environmental impact reduction. The open testbed is designed as a collaborative innovation ecosystem where research centres, technology developers, utilities and industrial partners can test, optimise and demonstrate disruptive solutions in real conditions. By reducing technical and operational barriers for technology validation, the platform aims to accelerate the deployment of sustainable desalination and brine valorisation solutions while fostering cooperation between public and private stakeholders.
>	Maven Brine Mining Plant – World 1st Commercial OARO Project: HPP & ERD On-Site Performance Results
	<i>Francisco <u>Jimenez Castellanos Lucena</u></i>, Danfoss (Spain)
	Desalination is a pivotal solution to securing fresh water for a growing global population and expanding industrial demand. The increasing production of desalinated water also creates an opportunity: the generation of brine enables the extraction of valuable minerals that would otherwise be discharged into the sea. The industry is now experiencing a shift toward ocean brine mining, turning a by-product into a resource while aligning with environmental regulations focused on protecting marine ecosystems. A major advancement supporting this shift is the development of membrane brine concentrator processes, which have the potential to replace traditional thermal systems. Membrane technologies offer significant advantages, including higher energy efficiency and a lower carbon footprint compared to conventional Zero Liquid Discharge (ZLD) approaches. This study examines the technological landscape of the world’s first commercial Osmotically Assisted Reverse Osmosis (OARO) brine mining project, assessing design options, operational performance, and energy consumption to provide insights into sustainable mineral recovery from brine. Field measurements of the high-pressure pumps and active energy recovery devices are detailed to demonstrate actual on-site performance.
>	The latest selective NF/RO architectures for near-saturation brine concentration
	<i>Santhosh <u>Ramalingam</u></i>, Dupont (Singapore)
	The increasing demand for freshwater combined with the challenges associated with brine disposal from seawater desalination processes or the opportunity to extract valuable minerals from brine have led to the development of more efficient and sustainable brine concentration methods. Traditional brine concentration methods, such as thermal evaporation, are energy-intensive and costly. The low salt rejection reverse osmosis (LSRRO) is a promising approach for brine concentration, which is useful for the valorization of salts present in seawater desalination or industrial wastewater brine and minimizing brine discharge. A new low salt rejection reverse osmosis membrane was developed with the aim of enabling sodium chloride salt concentration up to 250 g/L salinity. LSRRO membranes eliminate the need for a thermal evaporator after reverse osmosis (RO) and allows the concentrated brine stream to be fed directly into the crystallizer. This presentation describes the difference between Osmotically Assisted RO (OARO) process and LSRRO process and further discusses various design configurations using Seawater RO and LSRRO membranes in combination with highly selective NF membranes to achieve near-saturation brine solutions with optimal energy usage, minimal capital cost, or the ability to retrofit and upgrade existing desalination plants.

	[TS2.3] TREATMENT FOR MICROPOLLUANTS 18 June 2026 (Thursday) 9:00AM – 10:30AM Room 2
	Session Chair: Shane <u>Snyder</u> , Georgia Institute of Technology (United States), Wee Joon <u>Teo</u> , National University of Singapore (Singapore)
>	Hybrid Ceramic Membranes – An alternative for the Removal of Micropollutants
	Christian <u>Goebbert</u>, Acuriant Technologies (Germany)
	Hybrid membrane was developed employing technological advantages of ceramic filtration elements together with polyelectrolyte films to eliminate pharmaceuticals from aqueous solutions. The coating of Alumina ceramic membranes with nanosized polyelectrolyte films was performed using Layer-by-Layer technology. The technology is polyelectrolyte chains forming a network of nanopores over the ceramic surface. The consequent network of nanopores formed over the ceramic surface leads to enhanced rejection of small molecules like pharmaceuticals and microplastics, which can otherwise not be eliminated using standard ultrafiltration methods. The aim of the presented investigation was to examine the utilization of the new developed hybrid membranes in water filtration. This research compares properties like permeability, pore size distribution and Zeta Potential for ultrafiltration ceramic membrane and hybrid membrane. The repulsion of the membrane against oppositely charged molecules was characterized using streaming potential techniques. Investigation of filtration behaviour played the most significant role in membrane characterization. The retention of widely used pharmaceuticals like Diclofenac, Ibuprofen and Sulfamethoxazol was monitored in a series of filtration tests. Moreover, ionic strength respond of the hybrid membrane was investigated by determining the influence of a salt presence in the feed solution. The homogeneity of the applied coating layer and its penetration depth were studied by marking of polyelectrolyte molecules with fluorescent dyes and analyzing their distribution using fluorescence microscopy. The presented study offers a new perspective on removal of nanosized molecules from aqueous solutions and shows the significance of applying a combination of both the techniques (ceramic and electrolytes) for a successful elimination of pharmaceutical contaminants from drinking water.
>	Why PFAS Pilot Matter? Practical Considerations and Lessons Learned from the Field
	Elvin <u>Hossen</u>, De Nora Water Technologies (United States)
	Per- and polyfluoroalkyl substances (PFAS) are one of the most technically challenging emerging contaminant groups in recent days for water industry. As the regulation on PFAS becomes more stringent while public concern is increasing across the globe, stakeholders are cautious in making confident and defensible decisions about selecting and implementing the most sensible PFAS treatment technologies. While standard bench-scale experiments or Rapid Small-Scale Column Tests (RSSCTs) are valuable for early screening tools, they cannot capture the complexity, variability, and operational realities of full-scale PFAS treatment systems. When selecting appropriate technology, understanding the operational challenges, or projecting long-term full-scale implementation, pilot studies remain the most dependable and practical approach. However, even with existing pilot guidelines, significant gaps and uncertainties continue to make it challenging for the treatment facilities to plan and execute PFAS pilots that are well-structured, flexible, and valuable. Drawing from seven PFAS pilot studies conducted across the United States between 2024 and 2025 by De Nora Water Technologies (DNWT) and its pilot partners, this presentation provides practical guidelines for planning, executing, and interpreting PFAS pilots. Rather than focusing on the site-specific results of the pilots, it simply focuses on filling the gaps and providing key practices that are frequently overlooked in pilot studies. It outlines seven criteria for PFAS pilots reflecting recurring challenges encountered by DNWT at different sites and representing practical approaches to achieve the best possible pilot outcomes.
>	Comparison of UV-based and ozone-based advanced oxidation for taste & odor removal
	Uwe <u>Hubner</u>, Xylem Water Solutions (Netherlands)
	O₃/(H₂O₂) and UV/H₂O₂ treatment are compared for the reduction of 2- methylisoborneol (2-MIB) during Harmful Algae Blooms (HAB) at a case-specific, technical and economic analysis. Lab results as well as kinetic modeling were the basis for the exploration. An O₃/(H₂O₂) system was installed at full-scale. The detailed OPEX and CAPEX calculation proved, O₃/(H₂O₂) is the more cost-efficient alternative compared to UV/H₂O₂, even when considering the expansion of final UV disinfection for only seasonal operation as advanced oxidation process.

[TS2.4] LOW ENERGY DESALINATION 18 June 2026 (Thursday) 11:00AM – 12:30PM Room 7	
Session Chairs: Key Wee <u>Ong</u> , PUB Singapore’s National Water Agency (Singapore), Enyu <u>Liu</u> , National University of Singapore (Singapore)	
>	Beyond Energy Efficiency: The Broader Advantages of Semi-Closed Reverse Osmosis (SCRO) Desalination
Qianhong <u>She</u>, Nanyang Technological University (Singapore)	
Desalination via membrane-based reverse osmosis (RO) is one of the most promising solutions to address the issues of water scarcity and has attracted unprecedented interest in recent decades. However, the prevailing process, single-stage RO (SSRO), consumes much higher than thermodynamic minimum energy as its operation requires over-pressurization (OP) of the feed. Although alternative RO processes, such as batch RO (BRO), closed-circuit RO (CCRO), and multi-stage RO (MSRO), mitigate osmotic pressure (OP), they each have drawbacks. In BRO and CCRO, the mixing of recirculated concentrate with the feed increases entropy and energy consumption. Meanwhile, MSRO cannot utilize high-efficiency isobaric pressure exchangers, preventing it from achieving high energy efficiency in practice. Additionally, MSRO requires extra boosting systems, leading to higher capital expenditures. In this talk, I will introduce our invented RO process, namely, semi-closed reverse osmosis (SCRO), which can potentially address the issues of existing RO processes. This talk will elaborate the reasons for lower energy consumption and higher energy efficiency of SCRO. Beyond energy savings, SCRO has broader advantages over existing RO processes, such as low fouling, high water recovery, and high flexibility and resilience. Both modelling and experimental testing data will be presented to demonstrate the benefits of SCRO. This study suggests that SCRO can be a promising alternative to state-of-the-art RO processes in low-energy, low-fouling, and highly adaptive desalination.	
>	Novel Low Energy Seawater Desalination Solutions Empowered with SmartOps – A PUB Demonstration Plant Case Study
Jia Shin <u>Ho</u>, Gradiant (Singapore)	
With an abundant source of seawater worldwide, desalination is considered a viable option for sustainable water supply, despite its energy-intensive nature. This plant includes electrocoagulation (EC) for pretreatment, ceramic ultrafiltration (UF) for upstream filtration, batch reverse osmosis (RO) for seawater desalination and hybrid semi batch/batch RO for brackish water desalination. Each individual process unit has demonstrated potential for reducing energy consumption in seawater desalination systems. The plant is also equipped with SmartOps platform which allows each individual unit to operate at their optimum setpoints. Brine recycling in BWRO, partial bypass of SWRO permeate and the implementation of center-port pressure vessels for uniform flow distribution in batch process are proven to contribute to the lower energy consumption. The plant is designed to achieve an energy consumption of 1.96 kwh/m3 with 50% overall system recovery, yield 1125 m3/day of high-quality product (boron concentration of <0.5 mg/L). In addition, membrane lifespan is expected to improve by 25% while the frequency of RO cleaning-in-place (CIP) decreased by 8%.	
>	Benchmarking Scaled-up Hybrid Batch Reverse Osmosis against Conventional 3-stage RO process
Mathieu <u>Delahaye</u>, SUEZ (France)	
This study evaluates a high-recovery Hybrid Batch Reverse Osmosis (HBRO) system as an advanced treatment solution for municipal wastewater reuse. A pilot program was launched to compare a scaled-up HBRO unit (4 m³/h) with a conventional 3-stage RO system (30 m³/h) at a SUEZ facility in southern France. The conventional 3-stage unit was run at 70–85% recovery for over 9 months prior to the arrival of the HBRO unit to establish baseline conditions and pretreatment requirements. Salinity Solution’s HBRO process using a free piston-driven pressure-exchanger (winning Breakthrough Technology of the Year at the Global Water Awards 2025) was then commissioned to assess achievable recovery, energy use, and chemical savings. Preliminary results demonstrate that the HBRO process reliably reaches 90–95% recovery while maintaining treated water quality. Hydraulic specific energy consumption (SEC) at 90% was 0.25 vs. 0.35 kWh/m3 for the conventional 3-stage configuration. Ongoing parallel operation will quantify comparative benefits in energy consumption, recovery limits, and chemical demand	
>	Efficiency Evolution: Axial Piston High-Pressure Pump Solutions For Enhanced Plant Operations
Francisco Jimenez Castellanos <u>Lucena</u>, Danfoss (Spain)	
Reducing energy consumption and CO ₂ is a central priority in desalination plants as global water scarcity intensifies. Achieving this requires optimizing equipment selection, with particular focus on the high-pressure pumps (HPP), the main energy consumer in seawater reverse osmosis systems. The HPP can account for up to 70% of the plant’s specific energy consumption, representing as much as 40% of total cost of ownership over 20 years. This makes HPP efficiency essential for reducing operational costs and environmental impact. Ensuring stable and optimal performance across all operating conditions is equally important, given continuous variability in water and pressure demand. Danfoss enhances energy-efficient desalination with positive displacement axial piston pumps (APP), which maintain high efficiency regardless of flow or pressure variations. Their operational flexibility ensures consistent performance and meaningful energy savings in real operating environments. This paper presents the benefits and efficiency results achieved by Danfoss high-pressure pumps in desalination plants worldwide.	

	[TS2.5] ADVANCEMENTS IN REVERSE OSMOSIS 18 June 2026 (Thursday) 2:00PM – 3:30PM Room 2
	Session Chairs: <i>Mitchell <u>Dixon</u></i> , Ramboll (Australia), <i>Htun <u>Oo</u></i> , Meiden (Singapore)
>	RO Hidden Features: What You Can Achieve that Others Don't
	<i>Val <u>Frenkel</u></i>, Tylin International (United States)
	Reverse Osmosis (RO) systems consist of a number of RO elements enclosed within pressure vessels. Each RO element represents the smallest segment (standard module) of the entire membrane unit (membrane train) in respect to deriving system performance. Each membrane element is manufactured to meet nominal performance within a narrow range of water permeability, measured as permeate capacity, and salt transport measured as salt rejection. However, the performance of membrane elements could differ significantly, depending on the element model and manufacturers. Although they utilize standard membrane elements, RO systems can be designed in a variety of configurations and operate in a very wide range of process parameters. The variety of RO system configurations benefit from modular design and the intrinsic flexibility of RO technology while utilizing standard membrane elements with limited narrow properties. Some possible permutations of system configurations are related to: 1) Range of membrane area and nominal performance of membrane elements; 2) Partial two pass configuration with second pass processing of selected fraction of the first pass permeate; 3) Number of system passes; 4) Number of membrane elements per pressure vessels; 5) Use of inter-stage pressure boost; 6) Throttling of permeate from selected membrane stages; 7) Use of different membrane elements with different properties of significantly different permeability and salt rejection in a common vessel, the hybrid configuration; 8) Number of system stages; 9) Concentrate or permeate recirculation; 10) Recovery optimization vs. water quality and energy demand; 11) Brine Recovery RO (BRRO). And the never trend, the non-continuous RO adds to the variations of the RO treatment alternatives. Each of the listed system configurations enable different types of RO systems to achieve different targets of product quality or operating parameters when using commercial RO membrane elements.
>	Breaking Boundaries: Advancements in Sub-nanometer Pore Structure Control for Next-generation RO Membranes
	<i>Masaru <u>Horiuchi</u></i>, Toray Industries, Inc (Japan)
	Global water scarcity, intensified by climate change and population growth, demands advanced desalination technologies. Reverse osmosis (RO) is central to this effort; however, boron removal remains a persistent challenge due to its health risks and prevalence in seawater and brackish water. Our research addresses this issue by developing next-generation BWRO and SWRO membranes through precise control of polyamide layer morphology during interfacial polymerization. By tailoring polymerization conditions, we achieved sub-nanometer pore size distribution and enhanced polyamide protuberance structures, significantly reducing large pores without compromising water permeability. Atomic-resolution SEM imaging and alcohol permeation tests confirmed these structural improvements, correlating with superior boron rejection and enhanced neutral molecule removal. This breakthrough establishes a design principle that optimally balances selective water transport and high contaminant rejection. The RO membranes utilizing this technology were commercialized in 2025 as the TBW-XHR elements, offering excellent water permeability while achieving a substantial improvement in neutral molecule rejection compared to conventional membranes under low-pressure conditions. Their robust performance enables energy-efficient desalination and high-purity water production, making them ideal for single-pass brackish water treatment and industrial or medical applications requiring stringent purity standards. Our findings demonstrate that advanced structural analysis and precise polymerization control can overcome long-standing limitations in RO technology. By reducing the ratio of large pores, the rejection performance for neutral molecules was significantly improved. These membranes represent a significant step toward sustainable water solutions. Future work will expand applications to seawater desalination and specialized fields, aligning with global efforts to mitigate water scarcity through innovative, low-energy processes.
>	Tuas Desalination Plant 3 - Managing A Partial Membrane Replacement
	<i>Keith <u>Andes</u></i>, Nitto Hydranautics (Australia)
	The Tuas Desalination Plant 3 was built by the Spanish firm Tedagua and commissioned in 2018. The plant has operated effectively since commissioning but has experienced a gradual loss of productivity that cannot be rectified by membrane cleaning. Elements were sent back to Nitto Hydranautics facility in Oceanside, California for evaluation, and it was determined that a very fine colloidal silt was present on the RO membrane surface. This silt has proven to be very difficult to remove, and it has been observed at the other SWRO plants in the Tuas area. Even with UF pretreatment, this fine silt gets through to the RO membranes. Initially, high dP's caused by biological fouling at the feed end of the membranes and other foulants clogging the feed spacer were very difficult to remove. A cleaner was finally found that effectively reduced the high dP problems, but it was unable to restore productivity to each of the RO trains. Each of the trains was designed to produce 750 m3/hr, but with the high pressure pumps maxed out, some trains could only produce 600 m3/hr. The PUB – Singapore approached Nitto Hydranautics to come up with a plan for partial replacement to be able to restore productivity to 750 m3/hr for each train. This paper will discuss the steps that were taken to restore the first two trains back to normal operating parameters with partial RO membrane replacement.
>	Industrial Scale Fabrication and Applications of Low Energy Reinforced Membranes for Desalting
	<i>Wanting <u>Wang</u></i>, Separation Technologies Applied Research and Translation START (Singapore)
	Overall membrane thickness and concentration polarization are two key factors affecting membrane permeability. The reinforced membrane (RM) described in this presentation provides a means to reduce leaf set thickness in spiral wound module (SWM) and internal concentration polarization. A novel process has been developed to enable industrial-scale casting of polymer solution directly onto the permeate carrier which eliminates the need for non-woven (NW) polyester (PET) backing. Consequently, more membrane area can be packed in a standard SWM leading to higher permeability and lower energy consumption per unit volume of produced water. The elimination of NW backing reduces bulk material in the membrane substrate which results in significantly lower internal concentration polarization and hence higher flux in osmotically driven processes such as forward osmosis (FO). Through our collaboration with SideStroem Water Technologies Pte. Ltd START have successfully translated reinforced membrane from lab-scale hand-frame to industrial-size coating lines and working commercial SWM FO modules, where optimizing the feed and draw solution pressure differential was found critical to prevent delamination. Post-optimization, the FO SWMs demonstrated robust performance, confirming the RM's advantage for high-performance applications like textile wastewater treatment. Next, we will evaluate 2514 modules and fabricate 4040 modules for testing, progressing from simulated to real dye wastewater.

THEME 3: USED WATER MANAGEMENT, REUSE AND INDUSTRIAL WATER SOLUTIONS

[TS3.1] TREATMENT OF CONTAMINANTS OF EMERGING CONCERNS

15 June 2026 (Monday) | 9:00AM – 10:30AM | Room 3

Session Chairs:

Steven Lam, Gradiant (Singapore), Meibo He, National University of Singapore (Singapore)

> Breaking the PFAS Barrier: A Scalable Solution for “Forever Chemicals”

Wai On Leung, Waste & Environmental Technologies Limited (Hong Kong, China)

Per- and polyfluoroalkyl substances (PFAS), often called “forever chemicals,” represent one of today’s most urgent water challenges, resisting conventional treatment and persisting across water, soil, and ecosystems. Most existing approaches merely capture or transfer PFAS, leaving long-term risks unresolved. Our patent-pending, modular treatment platform integrates foam fractionation, advanced oxidation, and electrochemical mineralisation to achieve true PFAS destruction. This multi-stage design maximises radical generation, reduces energy demand, and enhances operational robustness, with key performance indicators including PFAS chain-length reduction, total organic carbon removal, and fluoride release as evidence of mineralisation. Containerised and scalable, the platform adapts to landfill leachate, industrial wastewater, and municipal systems, aligning with emerging regulatory standards worldwide and offering the industry a trustworthy, energy-efficient pathway to eliminate PFAS through sustainable destruction.

> Advancing Pharmaceutical Wastewater Treatment by Coupling Adsorption and Electrochemical Oxidation

Orlando Garcia-Rodriguez, National University of Singapore (Singapore)

Pharmaceutical wastewater, particularly from antibiotic production, poses critical environmental challenges due to the persistence and toxicity of active compounds. Conventional biological treatments are often inadequate, leaving residual pollutants and contributing to antimicrobial resistance. This study achieved the treatment of a real effluent from azithromycin manufacturing in a hybrid system coupling adsorption onto sintered activated carbon with electrochemical oxidation in a single reactor, while achieving simultaneous electrochemical regeneration of adsorbent capacity. This process enabled continuous pollutant capture and oxidative degradation, maintaining efficiency without adsorbent exhaustion. The system achieved >99% azithromycin removal and mineralisation, demonstrating near-complete elimination of the antibiotic and its organic load. These findings show that integrating adsorption with simultaneous oxidation and regeneration provides a sustainable, high-performance solution. The study concludes that this approach represents a significant advancement in the effective treatment of complex pharmaceutical effluents.

> Commercial-scale PFAS Remediation solution for Industrial Wastewater

Tyler Tay, Gradiant International (Singapore)

This abstract presents the findings of a field trial conducted at the firefighting training facility in Munich airport, Germany to treat PFAS-laden wastewater for safe discharge. The wastewater stream contains high levels of PFAS compounds mainly consists of Capstone A, Capstone B, PFOS, and 6:2FTS with a total PFAS concentration of 15.6 mg/L. The study was carried out over a 2-week operation period for performance evaluation. Advanced treatment processes including micro-foam fractionation and electro-oxidation were deployed to effectively separate, concentrate and destroy PFAS compounds. The results showed that Gradiant’s ForeverGone PFAS solution successfully removed 98.0% of Capstone A, 99.4% of Capstone B, 99.8% of PFOS, and 99.9% of 6:2FTS. Overall, total PFAS removal efficiency of 99.3% was achieved. The study provides a solid reference of the technology’s potential to address emerging PFAS regulatory requirements and contributes to a more responsible and sustainable management of PFAS in wastewater.

> Advancing the Water–Food–Energy Nexus - The Biosolids PFAS Challenge

Sarah-Jane Westlake, AtkinsRealis (United Kingdom)

Biosolids (treated sewage sludge) directly engage the Water–Food–Energy Nexus through treatment (e.g. by anaerobic digestion, forming energy-rich biogas) and end use (particularly biosolids used in agriculture). Even where incinerated, energy and nutrient recovery from biosolids is possible. Global biosolids regulation and their impact on circular water and food systems is rapidly evolving under pressure from emerging evidence on persistent chemicals, such as PFAS. This focusses on biosolids used in agriculture and PFAS risks to surface and ground water. However, PFAS emission through biosolids incineration and impacts on water systems across borders is also possible. Improving wastewater discharge compliance protects receiving waters but can concentrate contaminants in biosolids. This creates new challenges for circularity, depending on biosolids management. This paradox demands holistic mitigations considering upstream interventions and downstream treatment.

AtkinsRéalis will draw on projects across Europe, Asia, North America, and Oceania examining evolving regulations, PFAS limits, and risk trade-offs shaping global responses. We will explore how biosolids treatment decisions influence contaminant pathways and impact water and food security. We will emphasise source control as a possible PFAS mitigation, reducing reliance on expensive treatment solutions and enhance biosolids’ position within the Water–Food–Energy Nexus.

[TS3.2] NATURE-BASED TREATMENT 15 June 2026 (Monday) 11:00AM – 12:30PM Room 3	
	Session Chairs: Jay <u>Bhagwan</u> , WRC (South Africa), Enyu <u>Liu</u> , National University of Singapore (Singapore)
>	Algal-Based Wastewater Treatment: Balancing Nutrient Removal, Biomass Productivity, Resource Recovery, and Pathogen Removal
	Harizah <u>Hariz</u>, National Institute Of Water And Atmospheric Research (NIWA) (New Zealand)
	Algal-based wastewater treatment offers a sustainable approach by coupling water quality improvement with biomass generation for resource recovery. This study compared the performance of filamentous and planktonic algae operated in high-rate algal ponds (HRAPs) at the National Institute of Water and Atmospheric Research (NIWA) facility in Hamilton, New Zealand. Two planktonic HRAPs operated in parallel were evaluated against four filamentous HRAPs operated in series under identical total hydraulic retention times. Over one year of operation, water samples were analysed for ammoniacal nitrogen, nitrate, and phosphate removal, while algal biomass productivity was measured weekly. Filamentous algae consistently produced twice the biomass of planktonic algae at equivalent hydraulic retention times (HRT), with similar nutrient removal efficiencies. Both systems reduced biochemical oxygen demand (BOD) by up to 84% and Escherichia coli (E. coli) by at least 95%. These results demonstrate that filamentous algae provide higher nutrient recovery potential while maintaining effective wastewater treatment, supporting their application in integrated and sustainable treatment systems.
>	Microalgae-Driven Optimization of Electron Donor Utilization and Electron Transfer and Distribution Accelerates Nitrate Removal in Cocultured Paracoccus Denitrificans
	Yue <u>Li</u>, Tsinghua University (China)
	Human activities have drastically increased nitrate loading in natural waters, causing ecological disruptions and driving the implementation of stringent effluent standards. Biological denitrification remains the most widely adopted strategy due to its cost-effectiveness, operational simplicity, and low risk of secondary contamination. However, due to the limitation of organic carbon source as electron donors, nitrite removal efficiency in the effluent is often constrained by the poor nitrogen metabolic activity of microorganisms. In this study, a coculture of Chlorella vulgaris (C. v) and Paracoccus denitrificans (P. d) was established to mimic natural algal–bacterial consortia that play key roles in nutrient cycling, with the aim of elucidating how microbial interactions enhance nitrate removal. Nitrate and total organic carbon (TOC) removal, electron generation, and gene expression were systematically analyzed. The coculture exhibited markedly higher nitrate removal, strongly correlated with TOC depletion. Notably, even under conditions with sufficient external electron donors, microalgae further strengthened the denitrification performance of P. d, indicating the presence of non-nutritional induction mechanisms. Mechanistically, the presence of microalgae promoted bacterial glucose utilization, and the resulting intermediates activated electron-transfer pathways while glutamate-mediated signaling modulated the expression of terminal reductases. These coordinated interactions redirected more electrons toward nitrate reduction, thereby accelerating nitrate removal. Overall, these findings provide new insights into microalgae–bacteria cooperation and establish a mechanistic foundation for designing controllable strategies to enhance nitrate removal efficiency.

[TS3.3] INDUSTRIAL WASTEWATER TREATMENT 15 June 2026 (Monday) 2:00PM – 3:30PM Room 3	
	Session Chairs: Somnath <u>Basu</u> , Independent Consultant (United States), Orlando Garcia <u>Rodriguez</u> , National University of Singapore (Singapore)
>	Harnessing the power of water and energy to help decarbonize a chemical and petrochemical site
	Federico <u>Rizzo</u>, WSP (Italy)
	Chemical/petrochemical sites require high-quality water for cooling, production processes, and steam boilers. Typically, the location of these plants (Ravenna - Italy is into operations since 1958) was in areas with an abundance of surface water and integrated with a port to allow the transportation of raw materials and finished products via sea. From 2019, WSP provided RSI with a full set of design services (from feasibility to basic and detailed design for tender for construction) for the new water treatment plant, which is currently under construction. The WTP, based on ultrafiltration, double-stage Reverse Osmosis (RO), and Electro Deionization, will provide up to 650 m³/h of demineralized water and 250 m³/h of soft water to the users of the site. The new WTP will minimize the water footprint of the petrochemical site, as the water source could be 75% surface water and up to a maximum of 25% treated effluent from the inorganic wastewater treatment plant of the same petrochemical site. Brines from the first stage RO will be partially reused in the firefighting network. The design was made according to WSP's Future Ready™ approach as follows: Provision of a suitable modularization of the plant in multiple lines to cope with changing/evolving treated water demand. Construction of the new WTP inside the same building of the existing one, revamped for this purposes. A temporary containerized solution provides demineralized water to the site while the old equipment inside the building is being dismantled and the new ones installed. Incorporating the minimization of CO₂ footprint into the design from the beginning, as a decision tool. It was verified that the saving in CO₂ emissions associated with chemicals, (no longer be needed with the new configuration), will be more than offset the higher power consumption required by the membrane-based solution
>	Virtual piloting and model-based process design for smart optimization of a large industrial wastewater treatment facility
	Pieter <u>Vlasschaert</u>, AM-Team (Italy)
	Bayer's wastewater treatment plant (WWTP) in Antwerp (Belgium) processes 2 million m³ of wastewater annually, including an acidic stream historically neutralised with NaOH before biological treatment. This practice incurred high chemical costs and excessive sludge production in the WWTP from CaCO₃ precipitation at high pH. Bench-scale testing indicated that the denitrification process could provide sufficient self-neutralisation due to the OH⁻ ions that are naturally produced in the anoxic zone as a result of nitrate and nitrite conversion to nitrogen gas. An innovative combination of dynamic modelling and 3D computational fluid dynamics (CFD) simulation was used to translate the bench-scale insights to successful full-scale operation without the need for onsite piloting. Bench-scale testing data and full-scale operational data were combined to calibrate and validate the full-scale model. Virtual piloting showed that only partial neutralisation of the acidic stream (to pH 1.85) could maintain biological stability while significantly reducing CaCO₃ precipitation. CFD was then used to properly design the mixing system in order to minimise 'local pH toxicity' risks in the anoxic zone. Full-scale implementation in 2024 validated the predictions: NaOH use was reduced by 40% and sludge production by 35%, leading to hundreds of tons of chemicals saved annually and hence significant cost and sustainability benefits. The project demonstrates the value of virtual piloting and model-based design in accelerating sustainable process improvements, lowering costs, and reducing chemical use in industrial wastewater treatment.
>	Innovative Application of Prefabricated PTA²O Anammox Process for High-Ammonia Fermentation Wastewater: A Pilot Study
	Josh Tao <u>Hua</u>, Nexus-Ecosystems Pte Ltd (Singapore)
	The bio-fermentation industry requires sustainable solutions for wastewater characterized by high ammonium and organic loads. This study evaluates a novel 3 m³/d pilot-scale process combining an Anaerobic Continuous Stirred Tank Reactor (CSTR) with a Prefabricated PTA²O Anammox system. A primary objective was to maximize biogas production for downstream energy recovery, promoting resource circularity. This approach aligns with the strategic transition toward converting wastewater-derived biogas into electricity via Solid Oxide Fuel Cells (SOFC), a key focus for Singapore's future water infrastructure. The process utilized a unique nitrite supply strategy to mitigate toxicity from heterocyclic compounds in dust removal condensate. Findings demonstrated Total Nitrogen (TN) removal >90% and ammonia removal >99%. Crucially, the system efficiently converted high organic loads into biogas, supporting energy-positive treatment where high-efficiency fuel cells can potentially achieve >85% combined heat and power efficiency. This confirms the process as a robust solution for resource recovery and industrial wastewater compliance.

	[TS3.4] MANAGEMENT OF GREENHOUSE GASES 16 June 2026 (Tuesday) 2:00PM – 3:30PM Room 3
	Session Chairs: <i>Kartik <u>Chandran</u></i> , Columbia University (United States)
>	Decarbonizing wastewater treatment and sanitation through integration of sewer and non-sewer treatment technologies
	<i>Liron <u>Friedman</u></i> , Columbia University (United States)
	Inadequate wastewater treatment and sanitation approaches can contribute to not just compromised water quality but also to substantial anthropogenic greenhouse gas (GHG) emissions, including methane (CH₄) and nitrous oxide (N₂O). Through mechanistic process modeling, we examined the impact of integrating centralized-sewered water resource recovery facilities (WRRFs) and non-sewered water efficient sanitation technologies (WESTs) on Scope1 GHG emissions. Our results reveal that WRRF-WEST combinations involving septic tanks (ST) were associated with the highest overall GHG emissions, with progressively lower GHG emissions associated with pit latrines, composting toilets, and household reinvented toilets (HRT). However, process optimization, aimed at GHG emissions reduction from the integrated systems highlighted the potential for decarbonization, while meeting water quality goals. Our results also support the development of a GHG crediting framework that could promote efficient attainment of wastewater treatment and sanitation sectors by WWTP-WEST systems while operating with a minimal carbon footprint.
>	From Data to Action – Hybrid Modeling and Diagnosis to Reduce N2O Emissions at WRPs
	<i>Emma Ruqiao <u>Shen</u></i> , Jacobs International Consultants (Canada)
	This study presents an innovative hybrid modeling approach that integrates data-driven techniques with process knowledge to predict liquid-phase nitrous oxide (N₂O) concentrations. Successfully applied to long-term datasets from Elmira Wastewater Treatment Plant and Duffin Creek Water Pollution Control Plant in Ontario, the model and the applied diagnostic tools allowed multivariate analysis to identify key operational parameters driving N₂O formation. The results enabled the extraction of actionable information to develop mitigation insights. At Duffin Creek, the model is now being extended into a near real-time tool with prediction, forecasting and optimization capabilities via a cloud-based platform. These tools aim to support proactive operational decisions and reduce N₂O emissions.
>	Exploring Nitrous Oxide Dynamics in Biological Wastewater Treatment Systems through Machine Learning Insights
	<i>Kartik <u>Chandran</u></i> , Columbia University (United States)
	Nitrous oxide (N₂O) is a potent greenhouse gas that substantially contributes to the carbon footprint of wastewater treatment plants (WWTPs). Our previous work demonstrated that poor operational control drives N₂O production and emissions, regardless of process configuration. Although emerging biological nutrient removal (BNR) technologies effectively reduce effluent nitrogen, a limited understanding of their intrinsic dynamics hampers accurate assessment of N₂O emissions. In this study, we quantified N₂O emissions from advanced BNR processes in full-scale WWTPs across the Northeastern and Mid-Atlantic regions of the United States using a U.S Environmental Protection Agency (USEPA)- endorsed protocol. Real-time measurements were integrated into supervised ensemble machine learning (ML) models to predict emissions and identify critical operational variables. Model insights revealed conditions that exacerbate or mitigate N₂O fluxes and provided optimized strategies for process control. Importantly, these findings align with biochemical principles, underscoring the potential of ML to complement process knowledge and guide emission reduction in wastewater treatment systems.
>	Nitrous Oxide Emissions from Biological Processes at A Fully Covered Water Reclamation Plant in Singapore: Results from a Plant-Scale Monitoring Campaign
	<i>Zhou <u>Yan</u></i> , Nanyang Technological University (Singapore)
	Between March and August 2025, plant-wide N₂O monitoring was performed at three process trains (A, B and C) in a local Water Reclamation Plant (WRP) in Singapore, with emission factors (EFs, ratio of the emitted N₂O-N kg to total N load (kg)) computed per the IPCC methodology. Train C (MBR) showed uniformly low liquid-phase N₂O (<0.06 mg L⁻¹) and a low N₂O EF, whereas Trains A and B recorded higher EFs. Despite having a configuration broadly similar to Train A, Train B's EF was observed to be much lower. Diurnal patterns of N₂O EFs were train-specific: evening peak (Train A), bimodal (Train C), none (Train B).

[TS3.5] PROCESS INTEGRATION & INTENSIFICATION 16 June 2026 (Tuesday) 4:00PM – 5:30PM Room 3	
Session Chairs: <i>Mads <u>Leth</u></i> , VCS Denmark (Denmark), <i>Meibo <u>He</u></i> , National University of Singapore (Singapore)	
>	Elephants, Horses, and Hares: Incorporating Flexibility for Futureproofing Water Resource Recovery Facilities
	<i>Tim <u>Constantine</u></i>, Jacobs (United States)
	The water resource recovery industry faces the challenge of designing infrastructure that meets current needs while remaining adaptable for future demands. The advent of newer process intensification technologies (e.g., membrane aerated biofilm reactor [MABR]) and their intricacies in implementation, has elevated the need to plan appropriately for easy retrofitting in the future. This paper uses the idiom “Elephants, Horses, and Hares” to categorize treatment plant infrastructure by longevity, and focuses on planning and designing the longest tenured infrastructure (i.e., Elephants) with flexibility to adapt to an uncertain future. Full scale facilities, such as the Changi WRP, will be used as case studies on how the application of such flexibility features have been employed with success.
>	Effective densification in SBR: the right way to address stringent performances with less footprint
	<i>Mathieu <u>Delahaye</u></i>, SUEZ (France)
	Among the solutions of biological intensification, the Densified Activated Sludge (DAS) processes are a recent and promising one. This study presents the performances of DAS implemented in two Sequencing Batch Reactor (SBR) pilot-scale. Two units were implemented and operated on two wastewater treatment plants (WWTP) in France between 2020 and 2024. The results show an effective densification of the sludge characterized by percentages of granules higher than 30% and diluted sludge volume indexes (SVI) below 80 ml/g. Moreover, removal performances ranged from 70 to 85% for nitrogen, from 60 to 75% for phosphorus without metallic salt addition and from 85 to 90% for suspended solids.
>	Demonstration of Membrane Aerated Biofilm Reactor (MABR) and Continuous Flow Densification (CFD) for Process Intensification at Water Reclamation Plant
	<i>Han <u>Zhuang</u></i>, Veolia (Singapore)
	Increasing the biological and hydraulic capacity of existing treatment plants (WWTPs) depends on available SRTs, solids loading capacity of the clarifiers and available footprint. The combination of Membrane Aerated Biofilm Reactor (MABR) and Continuous Flow Densification (CFD) called zeeDENSE™ is being piloted at one of PUB’s Water Reclamation Plants (WRP) in Singapore to demonstrate the advantages of process and hydraulic intensification. One of the existing treatment trains consisting of 5-step feed reactors has been converted to zeeDENSE™ process with installation of total 10 ZeeLung™ cassettes distributed in anoxic zones 1-4 (3-3-2-2 configuration) and 4 zeeDENSE™ Hydrocyclones. In this report, process intensification has been evaluated at different loading and operating conditions. This demonstration aims to, but not be limited to, achieve increased biological treatment capacity, increased aeration energy efficiency, and decreased GHG emissions. The results will be used to extrapolate intensification in existing WRPs and set guidelines for the future.
>	More Intense? Planning Primary Filtration with Advanced Secondary Treatment at Subiaco WRRF
	<i>Sock Hoon <u>Koh</u></i>, B&V Australia (Australia)
	Enhanced Primary Treatment (EPT) is emerging as a key strategy for integrated wastewater systems, improving treatment efficiency, resilience, and energy balance. Among the various EPT technologies, primary filtration is increasingly being evaluated due to its compact footprint, high capture rates, and scalability. When combined with secondary intensification processes (e.g. MABR and/or MBR), further footprint reductions can be achieved, along with benefits such as carbon redirection and reduced off-site odour impacts. This paper presents findings from the primary treatment planning study for Subiaco WRRF, where additional 25% intensification in liquid treatment footprint was projected with primary filters without significantly impacting nutrient removal performance. With enhanced biogas production and energy recovery, the next-generation WRRF is one step closer to achieving energy neutrality.

[TS3.6] MANAGEMENT OF SEWER NETWORK 17 June 2026 (Wednesday) 9:00AM – 10:30AM Room 3	
	Session Chairs: Devaraj <u>Sanmuganathan</u> , PUB, Singapore's National Water Agency (Singapore)
>	Reducing the Consequences that Matter: Risk Based Management of Sewer Systems
	Susan <u>Moisio</u>, Jacobs (United States)
	This discussion focuses on how utilities can improve decision-making in sewer system management by adopting a risk-based approach that prioritizes both likelihood and consequence of failure. It highlights how focusing on the impacts that matter most enables more effective investment, stronger resilience, and better outcomes for communities and the environment.
>	Risk assessment of the sewer network to eliminate social and environmental damage
	Klara <u>Ramm</u>, Warsaw University Of Technology (Poland)
	Urban sewage systems are facing increasing operational challenges due to climate change and regulatory requirements. The recast EU Urban Wastewater Treatment Directive (2024/3019) emphasizes the integration of risk management into the planning and operation of wastewater infrastructure, yet methodologies tailored to urban sanitary sewage systems remain limited. This article presents the foundations of a methodology for developing a safety plan for a sanitary sewage network, aimed at reducing incidents that disrupt city operations. It should be emphasized that leaks from sanitary sewers, caused by the inflow of rainwater, are particularly dangerous and more difficult to control than combined sewers overflows. A key innovation is the introduction of a ranking stage for network components with similar characteristics (gravity and pressure sections, pumping stations, lift stations). This ranking enables utilities to identify high-priority facilities for detailed risk assessment, while deferring lower-priority components to optimize resource allocation. Developing this stage posed a significant challenge, particularly in selecting parameters such as physical characteristics, operational efficiency, location, and environmental impact. The subsequent semi-quantitative risk analysis considered hazardous events, including floods, power outages, and control system failures, which were evaluated using multidimensional severity criteria. The results confirm that the ranking improves objectivity and aligns with operational experience, providing a structured basis for prioritizing the most critical assets.
>	Sewer Pipe Corrosion Estimation Using Habitat Potential of Sulfate-Reducing Bacteria in Wastewater
	Junming <u>Zhang</u>, Tohoku University (Japan)
	The deterioration of underground sewer infrastructure is an escalating challenge for municipalities worldwide. This study aims to introduce a DNA-informed approach to classify pipeline corrosion conditions by predicting microbial presence, with a focus on sulfate-reducing bacteria (SRB) as key indicators. Next-generation sequencing (NGS) was employed to select SRB gene targets, which were then incorporated into a species distribution modeling (SDM) framework to estimate habitat suitability, achieving a TSS of up to 0.75 and an ROC-AUC of 0.95 for Desulfobulbus spp. Building on these results, machine learning-based classification models were developed to distinguish healthy from corroded pipes, reaching an ROC-AUC of 0.77. SDM can reliably predict specific SRB genus' presence possibility, which can be applied as a powerful parameter of pipeline corrosion condition.
>	Smart Maintenance for Smarter Cities: DSD's Strategic Approach to Drainage & Sewerage Asset Management
	Yiu Man <u>Lau</u>, Drainage Services Department (Hong Kong, China)
	To support Hong Kong's sustainable development, the Drainage Services Department (DSD) aims to deliver world-class wastewater and stormwater drainage services. However, aging infrastructure, evolving standards, limited accessibility, and climate variability pose significant challenges. In collaboration with Arup, DSD initiated a comprehensive study to develop a strategic, risk-based asset management framework for approximate 400 drainage and sewerage facilities. The study adopts international best practices and ISO 55001 standards to assess asset conditions and prioritize maintenance and improvement works using a customized Prioritization Decision Matrix (PDM), which integrates consequence, likelihood, and asset age. Trial applications demonstrated the PDM's effectiveness in identifying high-risk structures, enabling targeted interventions and optimized resource allocation. The study also explores innovative technologies and materials to extend asset life. This approach enhances resilience, safety, and operational efficiency, offering valuable insights for utilities worldwide facing similar urban infrastructure challenges.

	[TS3.7] REUSE 17 June 2026 (Wednesday) 11:00AM – 12:30PM Room 3
	Session Chairs: Norhayati <u>Abdullah</u> , Tokyo City University (Japan)
>	Overcoming Challenges in Treated Sewage Effluent Reuse: What’s Done and What’s Next- Middle East
	Duraisaminathan <u>Visvanathan</u>, Atkinsréalis (United Kingdom)
	Treated Sewage Effluent (TSE) reuse is vital for addressing water scarcity in the Middle East. This paper reviews progress and challenges across Gulf Cooperation Council (GCC) countries, focusing on treatment technologies, governance, and public acceptance. While advanced processes and infrastructure upgrades are underway, barriers remain—such as emerging contaminants, limited monitoring, and ecological impacts. Despite cost advantages over desalination, adoption is hindered by trust and perception issues. The study outlines a future strategy built on three pillars: quality assurance, public engagement, and ecological integration, positioning TSE reuse as a key component of regional water security.
>	Integration of Aerobic Granular Sludge process with Ultrafiltration for Reuse Water application – Anhumas Municipal WWTP a case study
	Roger <u>Pung</u>, Hasonking (Malaysia)
	The Anhumas Wastewater Treatment Plant (WWTP) is an existing WWTP of 630 l/s (54,432 m3/day) located in Campinas, Brazil, operated by the local water and sewage utility, SANASA. The plant is currently being retrofitted and upgraded to a compact wastewater treatment solution with treatment capacity of 1,115 l/s (96,336 m3/day). The upgrading is currently reaching physical completion with start-up schedule for 2026. The plant utilizing Nereda Aerobic Granular Sludge (AGS) technology with Ultrafiltration (UF) will be among the first in the world for AGS-UF configuration. This configuration significantly reduces life cycle costs through lower energy consumption, reduced membrane fouling with similar physical footprint compared to other common MBR configuration for reuse water application. The project will treat wastewater up to reuse water standard. Up to 400 l/s (34,560 m3/d) of reuse water will be supply to data centres for cooling operation. This paper will provide descriptions of the project, the challenges and drivers surrounding the project, the evaluation of whole life cycle cost during value engineering stage, reuse water application including discussion with potential/secured buyer/user, social benefit and positive environmental impact of this project.
>	Optimized Granular Activated Carbon Reactors for Micropollutant Removal and Real-Time Monitoring in Potable Reuse Applications
	Mathieu <u>Delahaye</u>, Suez International (France)
	The removal of organic micropollutants and other contaminants of emerging concern remains a critical challenge in advanced municipal wastewater treatment, particularly for potable reuse. Granular Activated Carbon (GAC) has proven effective in large-scale studies, yet most applications have been limited to post-tertiary treatment with low suspended solids and low hydraulic loads. This restricts its practicality for broader reuse contexts. In a three-year international project, SUEZ developed and validated optimized GAC reactors capable of operating directly after secondary treatment. These intensified systems integrate adsorption, biological activity, and particle filtration in a compact, multi-target process. Key innovations include: Semi-continuous carbon renewal, ensuring stable micropollutant removal while maintaining active biofilm communities. Intermittent de-clogging sequences, preventing premature fouling and reducing backwash demand, even with influent suspended solids >10 mg/L. Real-time fluorescence monitoring, providing more robust correlations with micropollutant removal than conventional UV254, enabling adaptive operation and reduced reliance on laboratory analyses. Pilot and demo-scale trials in France, Denmark, and Switzerland confirmed >90% removal of a broad spectrum of pharmaceuticals, PFAS, metals, and microbial indicators at empty bed contact times of 15–20 minutes. Performance was consistent across configurations, with compact reactor designs shown to be feasible without compromising efficiency. This optimized GAC technology, while used for removal of micropollutants as a tertiary step in WWTP, is also a major advance for potable reuse applications by combining adsorption and biological activated (like both GAC and BAC filters). The integration of continuous carbon renewal, fouling control, and real-time monitoring offers utilities a scalable solution that meets stringent performance and safety requirements while simplifying operation.
>	Evaluating the Impact of MBR Permeate Quality and Variability on Reverse Osmosis Performance for Wastewater Reuse
	Nicolas <u>Brion</u>, Suez International (France)
	Coupling Membrane Bioreactors (MBR) with Reverse Osmosis (RO) is gaining attention for municipal wastewater reuse but limited studies and references address the implementation and performance of the RO stage in such systems. A key challenge lies in the variability of MBR permeate quality, influenced by biological activity, operating cycles and membrane integrity. These fluctuations affect particle load, chemical parameters and organic content, influencing the design and efficiency of downstream RO, including pretreatment and achievable recovery rates. This study characterizes six MBR effluents, focusing on parameters not typically monitored in wastewater treatment (silica, phosphates, particle distribution, organic composition...) to evaluate impacts on RO. Hydraulic and chemical projections are performed to assess pretreatment needs (pre-filters, acid, antiscalants) and design. Results indicate that MBR effluents may pose a risk to RO membranes, underlining the need for robust and tailored pretreatment strategies.

	[TS3.8] ADVANCEMENTS IN NUTRIENT REMOVAL 17 June 2026 (Wednesday) 4:00PM – 5:30PM Room 3
	Session Chairs: <i>Mark <u>van Loosdrecht</u></i> , Delft University of Technology (Netherlands), <i>Enyu <u>Liu</u></i> , National University of Singapore (Singapore)
>	Adapting to changes in Incoming Influent from Design to Testing and Commissioning
	<i>Anne Marie Li Wen <u>Ang</u></i>, Jacobs International Consultants (Singapore)
	Singapore's evolving water demand is marked by a shift from domestic to industrial use. This has reshaped the influent characteristics entering water reclamation plants (WRPs). As industries such as wafer fabrication facilities, pharmaceuticals and data centres expand, the composition of used water has become more variable and complex. The almost decade long gap between the design and commissioning of Changi WRP Phase 2 presented a unique challenge: to adapt a pre-existing design to a different used water profile shaped by industrialization. This experience has shaped the approach to future WRPs. This paper focuses on the key challenges in process commissioning and how it was overcome by adapting the design to treat a lower carbon to nitrogen (C:N) ratio and higher ammonia concentration in the influent.
>	Technically Achievable Limit for Nitrate from Wastewater Treatment Plants
	<i>Amber <u>Bullen</u></i>, Atkinsréalis (United Kingdom)
	Nitrates from wastewater treatment plants are a global pollution problem, causing eutrophication in receiving water courses and impacting the quality of water for reuse. To address this, the UK and Ireland environmental regulators are looking to set new regulatory nitrate limits for water released back into the environment. However, at a global level, there is limited evidence on the performance of traditional and innovative treatment technologies currently deployed which would allow the Regulators to set new standards. In this presentation by AtkinsRéalís we will describe how UK Water Industry Research (UKWIR) is addressing this challenge and how the data gathered can provide insight which can be applied around the world . Over the course of 12 months, and a cost of many \$10ms, 31 full scale trial sites will be established and data gathered on the nitrate removal performance across specific treatment technologies to set new technically achievable limits.
>	Methanol-Fed Partial Denitratation in Mixed-Liquor Sequential Batch Reactor
	<i>Kartik <u>Chandran</u></i>, Columbia University (United States)
	Partial denitratation (PdN) is an engineering bioprocess that facilitates the selective accumulation of nitrite (NO₂⁻) through the incomplete reduction of nitrate (NO₃⁻) and can be supported by different electron donors such as methanol (MeOH). The adaptation of PdN in centralized systems can provide an efficient approach for biological nitrogen removal (BNR). This study investigates the stoichiometrically limited and operational controls to enhance MeOH-driven PdN in a sequential batch reactor (SBR). The results showed that the MeOH-driven PdN exhibited a NO₃⁻ conversion (nitrate reduction ratio, NRR = 67.2±1.9%) and a NO₃⁻ to NO₂⁻ accumulation (nitrite accumulation ratio, NAR = 26±1.6%) when operated at an influent chemical oxygen demand (COD) to NO₃⁻ ratio of 2:1, and solids residence time (SRT) of 6 days. The interplay between reduced carbon input and optimized SRT control underscores the importance of operational strategies in enhancing MeOH-fed PdN systems.

	[TS3.9] DATA CENTER WATER SOLUTIONS 17 June 2026 (Wednesday) 4:00PM – 5:30PM Room 5
	Session Chairs: Govind <u>Alagappan</u> , Gradiant (Singapore), Orlando Garcia <u>Rodriguez</u> , National University of Singapore (Singapore)
>	Systems Thinking for Addressing Data Centre's Water Needs
	Eveline <u>Ekklesia</u>, Ramboll (Singapore)
	Data centre development is increasing as computing demand surges due to artificial intelligence growth. Data centres are entering environments that may have existing water constraints. Reflecting on the Ramboll's work, water needs for data centres can be managed through a variety of techniques. Revisiting water and wastewater management strategies through a systems thinking context, we found that there is no one-size-fits-all solution. For instance, a temperate area may better align with adiabatic cooling which provides higher cooling capacity than air-cooled chillers. For tropical area, air-cooled chillers will be better for water conservation but water-cooled chillers gives higher cooling capacity. Reclaimed water is sustainable as a cooling water source, but may not be readily available. Other water reduction or replenishment strategies may be explored as an ongoing improvement by the site and part of overall corporate sustainability activities.
>	Data Centres – Blessing or Curse? How water authorities can drive the best long-term outcomes for a thirsty industry
	Celeste <u>Morgan</u>, Arup (Australia)
	Water plays a crucial role in supporting the digital transition, with unprecedented investment in data centres across our urban centres, each with potentially significant demands for water for cooling (depending on the location and suitable cooling technology). Understanding the feasibility of the location of data centres requires an understanding of their water demand alongside a holistic assessment of sustainable water sources available. By proactively planning data centre hubs in tandem with water infrastructure, there are also opportunities to unlock support for recycled water schemes, drive circular economies and benefit adjacent industries and communities. This paper shares recommendations for water authorities to drive water benefits locally and invites water authorities to consider their own role in shaping a more equitable and sustainable data centre futures.
>	Physics-Informed AI for Cooling Tower Optimization: A Case Study in the Food & Beverage Industry
	Maher <u>Damak</u>, Infinite Cooling (United States)
	Cooling towers are among the largest consumers of water in industrial and commercial facilities, representing roughly 50% of total site water use and consuming significant fan and pump energy. When cooling water temperature exceeds the design target, production efficiency drops, and water and energy consumption increases. Despite this impact, cooling towers are typically neglected and poorly monitored, with most facilities relying only on bulk inlet and outlet temperatures, and unable to detect most performance issues. This paper presents a case study at a manufacturing site where a novel digital twin system was deployed. Using wireless IoT sensors and physics-informed machine learning, the system continuously quantified overall and component-level cooling tower efficiency, identified bottlenecks, and recommended targeted corrective actions. The technology enabled measurable improvements in energy and water use, production capacity, and equipment reliability. The project achieved significant annual savings with a return on investment within 4 months, while supporting the company's sustainability objectives.
>	Electro-ceramic desalination to improve cycles of concentration in cooling towers
	Jimmy <u>Yu</u>, PepsiCo (United States)
	Cooling tower blowdown reduction and reuse is an appealing target for improving the overall water usage of many industrial facilities. Generally, this stream is challenging to treat with many traditional water treatment technologies due to scaling ions, added chemicals, and other foulants. Electro-ceramic desalination (ECD) is a novel technology that utilizes nanoporous ceramic membranes and electrochemical processes to desalinate water. ECD treatment on a model solution of worst-case blowdown solution that contained 400 ppm of calcium demonstrated up to 96% water recovery when treating back to feed water quality of 1,500 ppm total TDS. The process utilized 1.39 kWh/m3 of feed water. Considering a cooling tower that was initially achieving 3 cycles of concentration, this process would improve the overall cycles of concentration to ≥ 17 and enabling up to 90% water savings. ECD is a low-pressure technology that allows water to be treated fit for purpose allowing for optimized water savings and recoveries throughout industrial facilities.

[TS3.10] ADVANCEMENTS IN THERMAL TREATMENT OF BIOSOLIDS 18 June 2026 (Thursday) 9:00AM – 10:30AM Room 3	
Session Chairs: Colin <u>Newbery</u> , Jacobs International Consultants (Singapore); Enyu <u>Liu</u> , National University of Singapore (Singapore)	
>	Alternative strategies for Biosolids - Advanced Thermal Conversion
	Stephen <u>Riches</u>, Atkinsréalis (United Kingdom)
	This paper examines the evolving challenges and opportunities in biosolids management, focusing on the UK and global context. As regulatory and environmental pressures mount, particularly around contaminants like PFAS and microplastics traditional land application routes for sewage sludge are increasingly constrained. Advanced Thermal Conversion (ATC) technologies are highlighted as promising solutions. These processes convert sludge into valuable outputs such as biochar, syngas, and recovered nutrients, supporting circular economy principles by enabling resource recovery and renewable energy generation. The paper assesses the technical readiness and effectiveness of ATC, while noting significant knowledge gaps regarding contaminant fate. The successful market deployment of ATC products will depend on clear regulatory frameworks and robust quality standards. Ultimately, ATC technologies offer a pathway to resilient, sustainable, and circular biosolids management for the future.
>	Sustainable Sludge Management with Continuous Thermal Hydrolysis (CTH) and Pyrolysis for Biochar Production
	Chenghong <u>Guo</u>, Leader Environmental Technologies Limited (Singapore)
	Leader Environmental Technologies (LET) has developed an integrated Continuous Thermal Hydrolysis (CTH) and Pyrolysis system for sustainable sludge management. A 5 tons/d demonstration plant was installed and optimized at PUB's Changi WRP to evaluate the system performance with PUB anaerobically digested (AD) dewatered sludge, which differs from China's sludge in impurity and volatile matter (VM) content. The optimized system achieved 82-85% mass reduction with CTH alone and 91-93% with CTH + Pyrolysis, while maintaining sludge cake dry solids of 70-72.9% and automatic drop from the plate. The specific heat energy consumption was 285–300 kWh/ton sludge (20% dry solids DS) for the CTH system alone, and 430–475 kWh/ton sludge (20% DS) for CTH + Pyrolysis, potentially reducible to 120-147 kWh/ton through heat recovery from the pyrolysis gas and the filtrate COD. The CTH-Pyrolysis system also produces biochar with 19-20.6% carbon content, and demonstrates the low-carbon and closed-loop sludge management philosophy.
>	Thermal Transition Management In Anaerobic Digesters: Insights From Full-Scale Thp-Ad And Conventional Systems Operating At 40–55 °C
	Ester <u>Rus Perez</u>, Cambi (United Kingdom)
	Maintaining anaerobic digesters at mesophilic temperatures (38–40 °C) can be challenging in warmer climates or where thermal pre-treatments (e.g. THP or pasteurisation) are used. In several UK utilities, including Thames Water, undersized or fouled cooling systems have made 40 °C unachievable during summer months. While conventional understanding suggests bacterial efficiency drops between mesophilic and thermophilic (55 °C) ranges, long-term operation at 45–50 °C has yielded unexpected results. Thames Water operates eight THP sites at elevated temperatures and has observed sustained biogas production, stable volatile solids reduction (VSR), and good dewatering performance. This paper presents 10 years of operational data and practical insights from these sites.
>	Combining thermal hydrolysis with pyrolysis to address high energy balance of processing
	Bill <u>Barber</u>, Cambi, Inc. (United States)
	There is growing concern related to the potential health impacts of continued application of biosolids, produced during wastewater treatment, to land. This has led to a trend in the use of advanced thermal processes such as pyrolysis and gasification. Thermal hydrolysis (TH), a popular pre-treatment to digestion with approximately 130 facilities worldwide, including Singapore, has typically been associated with producing a high-quality biosolids product for land application. However, less well known is that TH was initially conceived as a dewatering aid prior to thermal processing. The dewaterability improvements afforded by TH become of interest with advanced thermal processing. Systems such as pyrolysis and gasification are limited as they are fundamentally dependent on requiring a dried feedstock, typically over 85% solids. Drying of sludge is extremely energy (and subsequently carbon) intensive regardless of energy recovery. This paper looks at how thermal hydrolysis with and without digestion influences the energy demands and outputs of pyrolysis for management of microcontaminants

[TS3.11] ADVANCEMENTS IN BIOSOLIDS MANAGEMENT 18 June 2026 (Thursday) 11:00AM – 12:30PM Room 3	
	Session Chairs: <i>Sock Hoon Koh</i> , Black & Veatch (Australia)
>	Volatile Solids Reduction, decoded: machine learning predicts digestion performance and its ripple effects across wastewater operations
	<i>Mathieu Haddad</i>, Suez International (France)
	Predicting Volatile Solids Reduction (VSR) is critical for sizing municipal sludge digesters, yet existing models—tailored for operational forecasting—struggle at the design stage due to their dependence on historical data, often resulting in oversized or undersized systems. To resolve this, we developed a mathematically explicit, data-driven VSR model specifically for mesophilic anaerobic digestion, serving as a practical design tool for engineers. Trained on 32+ years of data from six industrial plants (192–4,696 days per plant, diverse treatment lines), the model outperformed ADM1 (calibrated and uncalibrated), delivering the lowest prediction error (RMSE: 4.2%VSR) and bias (2.3%VSR)—even for unseen plants, proving its reliability for real-world design. Beyond sizing digesters and biogas networks, it enables dynamic sludge age control during operations, directly boosting methane yield. Unlike conventional models, ours eliminates conservative guesswork, providing actionable accuracy for both new builds and retrofits. By converting VSR prediction from a bottleneck into a decision-making asset, this work advances sustainable, cost-efficient wastewater treatment.
>	Fuzzy Logic Decision Support Application to the Optimization of Sludge Dewatering
	<i>Sofiane Mazeqhrane</i>, Suez / Cirsee (France)
	Centrifuges are commonly used for sludge thickening and dewatering in wastewater treatment plants, but their performance and optimal settings are often hard to predict and optimize. This paper proposes a new decision support system to assist field operators in managing the system. The algorithm is based on a fuzzy inference approach using rules derived from expert interviews. It employs approximate reasoning, particularly Generalized Modus Ponens, to integrate diverse inputs from sensors, grab samples analyses, and human perception. Validation tests on real sludge with a pilot centrifuge under various constraints demonstrated effective optimization of centrifuge parameters. Furthermore, scale-up tests indicated that this approach can lower overall dewatering workshop costs by up to 10 % (€/ton dry solids) and optimize operations even without installing online sensors. These results highlight the robustness and practical value of the fuzzy decision support system for enhancing sludge treatment performance.
>	Modular Rotating Belt Fine Sieve for Biological Capacity Enhancement and Surplus Sludge Reduction
	<i>Yit Guan Chew</i>, Nijhuis Industries Asia Pacific Pte Ltd (Singapore)
	This study evaluates Rotating Belt Fine Sieves (RBF), employing a 350-micron mesh, as a compact and cost-efficient alternative to conventional Primary Settling Tanks (PSTs) for overloaded Sewage Treatment Plants (STPs). Performance data demonstrate significant load reduction, achieving average removals of 37% for TSS, 22% for COD, and 20 % for BOD5. This efficiency leads to substantial operational savings in the downstream biological process: RBF application significantly reduces the required aeration energy by removing a high portion of the TSS, specifically the inert fibrous material, which results in a more active biomass at lower Mixed Liquor Suspended Solids (MLSS) concentrations, thereby reducing oxygen demand from endogenous respiration and decreasing surplus sludge production. Furthermore, RBF installations require 6 to 12 times less area than PSTs, and the recovered screenings possess a high Biomethane Potential (BMP), offering a valuable source for on-site energy recovery via digestion. In conclusion, RBF technology can increase STP capacity by up to 20% and offering footprint-reducing solution for plant upgrades.

[TS3.12] ADVANCED CONTROL AND MACHINE LEARNING 18 June 2026 (Thursday) 2:00PM – 3:30PM Room 3	
	Session Chairs: Andrew <u>Shaw</u> , Black & Veatch (United States), Dr Huang Sheng, National University of Singapore (Singapore)
>	Integrated Digital Twin and Hybrid Feedforward–Feedback Control for High-Performance Nitrification at a Full-Scale WRRF
	Jeffrey <u>Sparks</u>, Hampton Roads Sanitation District (United States)
	Digital Twins (DTs) offer utilities an opportunity to improve biological process understanding, operational efficiency, and regulatory compliance, yet full-scale demonstrations with measurable benefits remain rare. At the Hampton Roads Sanitation District (HRSD) Nansemond Treatment Plant (NTP), a purpose-built nitrification-focused DT was developed to improve ammonia control, minimize aeration energy, and support mainstream partial denitrification anammox (PdNA) and indirect potable reuse (IPR). The DT continuously simulates plant behavior in real time and soft-senses nitrifier kinetics, informing a hybrid feedforward–feedback controller that integrates mechanistic modelling with lightweight machine learning models. The controller includes a mechanistic ASM1-based module, a Mechanistic Error Forecasting Engine (MEFE), and a Residual Oscillation Forecasting Engine (ROFE). Full-scale implementation reduced ammonia controller mean-squared error by 94% and significantly stabilized effluent concentrations. The combined DT–hybrid framework demonstrates an operationally practical pathway for utilities adopting real-time, AI-assisted aeration control.
>	Automated Control Performance Monitoring in Wastewater: Determining When and How to Retune Controllers
	Ryan <u>Ng</u>, Matten Plant (Singapore)
	Reliable process control is essential for efficient wastewater treatment, yet many controllers remain on vendor defaults, conservative safe values, or parameters copied from similar loops. Retuning is often delayed because operators lack clear guidance on when it is required and how it should be performed, while conventional bump tests are disruptive to closed-loop operation. This study presents an automated Control Performance Monitoring (CPM) methodology that integrates data quality checks, benchmark modeling, a Control Performance Index (CPI), and structured alarm logic. CPM provides actionable recommendations and distinguishes between tuning and constraint-related issues. Application at Metro Water Recovery (MWR) showed that CPM could suggest reasonable parameters soon after controllers were switched from DCS defaults to automatic operation and then track performance improvements under full-scale conditions.
>	Dynamic Header Pressure (MOV/MIV) and Minimal-DO Control: Cutting Blower Power without Compromising Process Reliability to Reduce the Carbon Footprint
	Heiko <u>Hermann</u>, Binder GmbH (Germany)
	Aeration accounts for 40–70% of the energy demand in biological wastewater treatment—making it the largest savings opportunity. This paper presents an intelligent aeration control concept that combines dynamic header pressure management based on Most Open-/Most Important Valve (MOV/MIV) with zonal airflow control and load-dependent, adaptive DO setpoints. An advanced aeration controller system adjusts air supply and common header pressure in real time to the prevailing load, stabilizes DO distribution, and simultaneously safeguards nitrification and compliance with effluent limits (NH₄/TN). Long time field installations show that even moderate reductions in header pressure and DO significantly cut blower-air demand and typically lower energy use by up to ~20%. Improved denitrification further reduces chemical consumption, delivering noticeable OPEX savings (in the reference case up to approximately \$222,000 per year) and lower CO₂ emissions—without increasing process risk. The paper provides measured data, practical guidelines, and a scalable architecture for retrofits and new builds, targeting decision-makers and operations teams seeking robust, low-energy aeration solutions.
>	AI Optimisation of Membrane Cleaning in Wastewater Facilities
	Mohammad <u>Alizadehfard</u>, Osmotec (Australia)
	The management of wastewater and landfill leachate plants is significantly hampered by membrane fouling and variable leachate quality, resulting in increased operating costs, downtime, and chemical consumption for councils, regional water utilities, landfill operators, and industrial sites. Many current facilities utilise fixed PLC/SCADA systems and reactive maintenance strategies, which limit operational efficiency. To address these challenges, we propose an innovative AI-driven smart controller that enhances existing control systems. This solution learns from plant telemetry data, continuously predicting fouling and scaling risks while optimising cleaning-in-place (CIP) strategies. By providing operators with intelligent, ranked recommendations on recovery, pressure, and dosing, the controller facilitates enhanced operational decision-making. The AI smart controller employs machine learning models combined with physics-informed features—such as flux decline and turbidity—to estimate remaining useful run times and flag abnormal operating states earlier than traditional alarms. Its vendor-agnostic design enables performance learning across multiple plants, creating a shared library of operational patterns that improve efficiency over time. Pilot deployments will occur at two wastewater and leachate treatment facilities in New South Wales, supported by a MobileLab campaign to capture a diverse range of operational conditions. Key performance targets include a 20-40% reduction in CIP frequency and chemical use, as well as extending run times between cleanings by 25-50%. The proposed commercial model encompasses hardware retrofits and subscription-based services for monitoring and optimisation, presenting a scalable, sustainable solution that minimises operating expenses, energy use, and chemical footprints. This AI smart controller not only modernises wastewater treatment operations but also fosters local software and data roles, aligning with the evolving needs of wastewater management in New South Wales.

[TS4.1] CLIMATE RESILIENT WATER SYSTEMS PLANNING
15 June 2026 (Monday) | 9:00AM – 10:30AM | Room 4

	Session Chair: <i>Tony Wong</i> , Monash University (Australia), <i>Mark Smith</i> , RSK Group (United Kingdom)
>	City Water Resilience Approach: Moving from Climate Diagnostics to an Enabling Environment for Urban Water Investment in Lagos State
	<i>Martin Shouler</i>, Arup (United Kingdom)
	Lagos, Africa’s largest megacity, faces a paradox of water abundance and scarcity, with less than 10% of residents connected to municipal supply and non-revenue water exceeding 60%. This paper focuses on Stage 3 of the open-source City Water Resilience Approach (CWRA) where diagnostics were translated into a practical enabling environment roadmap for reform and investment. Through extensive stakeholder engagement and evidence-based analysis, the roadmap sets out a phased strategy to overcome system barriers in governance, regulation, data, and finance. By creating predictable rules, integrated data systems, and professionalised institutions, Lagos is positioned as an investor-ready, climate-resilient water sector. This approach offers a replicable model for other rapidly growing cities seeking to close service gaps and achieve the United Nations’ Sustainable Development Goals (SDGs) 6 and 11.
>	AI-Driven Decision Support for Long-Term Water Grid Resilience and Investment Planning
	<i>Lydia Tsiami</i>, KWR Water Research Institute (Netherlands)
	Drinking water utilities face increasing uncertainty from climate change, urbanisation, and ageing infrastructure, making long-term planning increasingly complex. Beyond securing a reliable and cost-efficient supply, utilities must also protect vulnerable ecosystems. This study applies reinforcement learning (RL) to the strategic planning of Vitens’ network, the largest drinking water utility in the Netherlands, which relies on 86 groundwater-based production sites. The objective is to identify a flexible supply strategy at the strategic level that can adapt across a range of plausible futures while reducing reliance on high-cost and environmentally sensitive production sites, such as those located (i) near Natura 2000 areas or (ii) on vulnerable soils. We frame the problem as a staged optimisation task solved with Proximal Policy Optimisation (PPO), extending traditional cost-based objectives by introducing environmental surcharges that discourage reliance on sensitive abstraction points. Results showed that RL outperformed expert-designed strategies in static optimisation, cutting active production sites from 86 to 56, and introducing four new ones while satisfying all system constraints. With environmental surcharges applied, feasible solutions remained, though costs increased (13%) to achieve reductions (9% extra) in abstraction from sensitive sites. In the flexible optimisation, the RL agent generated robust strategies across three demand scenarios to 2050, identifying common early interventions and scenario-specific adaptations. Under high-growth demand, at least 80 production sites remained necessary, indicating that Vitens will need to broaden its intervention space or develop new capacity to further reduce reliance on vulnerable areas. Overall, the findings highlight RL’s value in supporting dynamic, scenario-aware infrastructure planning and advancing the development of next-generation decision-support tools for the water sector.
>	Climate Resilient Water Management for Arid Coastal Agricultural Zones: Integrated Stormwater, Groundwater & Tse Reuse Framework
	<i>Saleem Sarwar</i>, SMEC (Pakistan)
	Climate-vulnerable coastal regions face increasing hydrological stress from extreme rainfall, variable recharge, declining groundwater levels, and growing agricultural water demands. This study develops an integrated water management framework that combines stormwater infiltration, wadi-based flood mitigation, groundwater optimisation, and reuse of tertiary treated effluent (TSE) to support climate-resilient agriculture in arid coastal catchments. Using a representative coastal watershed in northern Oman, the approach incorporates watershed delineation, climate-driven rainfall projections, hydrodynamic flood modelling, and crop water requirement analysis to assess long-term water security. The results show that nature-based stormwater pathways, decentralised detention, and protective wadi buffers substantially reduce inundation risk while enhancing groundwater recharge. A hybrid irrigation supply balancing controlled aquifer abstraction with TSE reuse can meet crop water needs while mitigating downstream aquifer stress. The framework provides a scalable and transferable model for improving water resilience, food security, and climate adaptation across GCC and other arid regions.

	[TS4.2] INNOVATIONS IN COASTAL RESILIENCE 15 June 2026 (Monday) 2:00PM – 3:30PM Room 4
	Session Chair: Tomoya <u>Shibayama</u> , Waseda University (Japan), Mark <u>Fletcher</u> , Arup (United Kingdom)
>	Development of Planning and Design Parameters for Singapore’s Coastal Protection Code of Practice (CP COP)
	Jen Yee <u>Chin</u>, Jacobs International Consultants (Singapore)
	Singapore is vulnerable to rising sea levels arising from climate change. To safeguard its coastlines, PUB, Singapore’s National Water Agency is developing the nation’s first Code of Practice on Coastal Protection (CP COP). This will be a regulatory document that will provide the planning, design as well as operation and maintenance requirements for Coastal Protection Measures (CPMs). The CP COP will adopt a risk-based approach, balancing prescriptive requirements and performance-based outcomes. It also standardises coastal design parameters, which are derived from Joint Probability Analysis (JPA) of water levels and waves, to ensure consistent protection nationwide. Developed through stakeholder consultation and international benchmarking, the CP COP will be a living document that evolves with science and practice, laying the foundation for resilient and future-ready coastal defenses.
>	Polder Water Management: Adapting Dutch Principles to a Tropical Coastal Environment
	Matthijs <u>Bos</u>, Haskoning Singapore Pte Ltd (Singapore)
	The development of polder systems in tropical coastal environments marks a significant shift away from resource-intensive traditional land reclamation methods, offering innovative solutions to the pressing challenges of climate change and water management. By applying the proven Dutch polder concept—long recognized for its efficiency in temperate zones—to the complex realities of tropical climates, this study explores adaptive strategies aimed at maintaining dry polder land amidst increasingly intense rainfall, rising sea levels, and tidal surges. Our research, conducted within a coastal polder equipped with robust ring dikes, automated pumping stations, and controlled outfall structures, underscores the importance of integrated water management strategies that are specifically adapted to the distinct hydrological and climatic conditions found in tropical regions. Through a combination of field surveys, hydrological-hydraulic modeling, and operational analysis, we learned that flexible infrastructure placement, dynamic water level control, and real-time monitoring are essential for building resilience. The findings emphasize that successful adaptation of Dutch polder technology in tropical settings hinges on a thorough understanding of local rainfall patterns, soil behavior, and tidal influences. The lessons drawn from this work not only inform future polder development in tropical climates but also demonstrate the potential for sustainable coastal management through innovation and strategic adaptation.
>	The First Barrage Scheme in Hong Kong: A Holistic Approach to Flood Protection and Nullah Revitalisation
	Sylvia <u>Chan</u>, Binnies Hong Kong Limited (Hong Kong)
	The Yuen Long Barrage and Nullah Improvement Schemes mark Hong Kong’s first large-scale barrage project, designed to enhance urban water resilience against both shocks (short duration events e.g. pluvial flooding) and stresses (incremental events e.g. sea level rise). Situated in a low-lying densely-populated area, the project integrates climate adaptation, river revitalisation and engineering innovation into a multi-functional infrastructure system. Key components of the schemes include comprises a 300 m³/s capacity stormwater pumping station, a 60m wide tidal barrier, 2 km of river revitalization and a dry weather flow interception (DWFI) system. The design collectively safeguards the upstream Yuen Long town centre from future climate variations while improving water quality and biodiversity. This paper outlines the design rationale, climate adaptation strategies, and early outcomes, offering practical insights for cities aiming to embed resilience into their water infrastructure.
>	Defining Wave Overtopping Criteria for Singapore Code of Practice on Coastal Protection
	Matthijs <u>Bos</u>, Haskoning Singapore Pte Ltd (Singapore)
	Designing for wave overtopping for coastal protection structures is critical as it potentially affects structural stability and human safety. Singapore first Code of Practice on Coastal Protection (CP COP), developed by PUB, Singapore’s National Water Agency, sets out mandatory requirements for Coastal Protection Measures (CPMs), including the hydraulic design requirements and allowable overtopping discharge rates. These requirements are tailored to local wave conditions while benchmarked against international manuals such as EurOtop 2018. Computational Fluid Dynamics (CFD) modelling was also done to validate the discharge rates for human safety against previous studies. These permissible discharge rates form the basis for the Wave Allowance (WA), which, together with the Design Water Level (DWL), defines the overall Coastal Protection Level (CPL) for Coastal Protection Measures (CPMs). This approach ensures CPMs provide adequate protection against combined extreme surge and wave events.

[TS4.3] URBAN FLOOD RESILIENCE: STRATEGIES AND TOOLS 15 June 2026 (Monday) 4:00PM – 5:30PM Room 4	
	Session Chair: <i>Eugene <u>Chum</u></i> , PUB Singapore’s National Water Agency (Singapore)
>	Flood Management Strategies in Hong Kong: Addressing Climate Change Impacts through Progressive Adaptive Approach combining with Adaptation, Resilience, and Management (ARM)
	Alex <u>Wu</u>, AECOM (Hong Kong, China)
	Hong Kong, a subtropical coastal city, faces increasing flood risks driven by climate change-induced extreme rainfall, rising sea levels, and storm surges. To address these challenges, the Government of Hong Kong Special Administration Region of the People's Republic of China (here after the “HKSARG”) has adopted a Progressive Adaptive Approach, integrating Adaptation, Resilience, and Management (ARM) strategies. This comprehensive, multi-pronged strategy includes drainage improvement projects, integration of blue-green infrastructure in new developments, adopting flood protective measures for properties, enhanced emergency preparedness and advanced flood management technologies. By balancing cost-effectiveness with long-term resilience, this approach ensures adaptability to evolving climate scenarios, safeguarding public safety and critical infrastructure against extreme weather events. The remarkable resilience of the city and the effectiveness of the flood management strategy are demonstrated by its speedy recovery to normal operation the next day following the passage of Super Typhoon Ragasa in September 2025.
>	Reimagining Flood Resilience: A Multi-functional Floodable Open Space in Hung Shui Kiu / Ha Tsuen New Development Area
	Kenneth <u>Kwok</u>, Ove Arup & Partners Hong Kong Limited (Hong Kong, China)
	The Hung Shui Kiu / Ha Tsuen New Development Area (HSK/HT NDA) is a major urban development project in Hong Kong, designed to accommodate approximately 226,000 residents while ensuring long-term climate and socio-economic resilience. To address increased surface runoff and flood risk, two multi-functional floodable open spaces (FOSs) are integrated within planned parks, combining flood attenuation with public amenities. The floodable open space strategy in HSK/HT NDA exemplifies a forward-thinking approach to climate-resilient urban development. By integrating hydraulic engineering, nature-based solutions, and multi-functional land use, the design not only mitigates flood risks but also enhances ecological value, public amenity, and create a seamless transition between the built and rural environments. The purposeful co-location of flood attenuation facilities within public parks maximizes land efficiency, allowing essential infrastructure to serve both environmental and community needs. Key innovations, including smart flow control, gravity-based outlets, and cost-effective seepage management, ensuring operational efficiency, sustainability and public safety. The project demonstrates how infrastructure can be reimagined to serve both environmental and community needs, offering a replicable model for future urban developments facing emerging climate challenges.
>	A Scalable, Open-Source Approach to Improving Stormwater Infrastructure Under a Changing Climate
	Joe <u>Shuttleworth</u>, Arup (United States)
	Cities worldwide face increasing flood risk, water-quality decline, and ageing stormwater networks that cannot easily be expanded. This project presents a practical, open-source framework that helps utilities and watershed agencies improve the performance of their existing stormwater infrastructure without major capital investment. Developed for the Indian River Lagoon in Florida, the approach integrates accessible geospatial tools, simple digital representations of basin networks, and scenario-based analysis to identify where operational changes or small retrofits can deliver the greatest impact. The framework highlights priority locations, evaluates benefits of coordinated management, and provides transparent evidence to support investment and operational decisions. Early findings show that many stormwater ponds and basins can achieve significantly better retention, reduced downstream flooding, and improved water-quality outcomes through smarter operation. The open-source design ensures that the approach can be easily adopted, scaled, and adapted by cities globally.
>	When is a flood defence not a flood defence? When it's an Amphitheatre!
	Paul <u>Hargreaves</u>, Jacobs (United States)
	Sidmouth, located on the southwest coast of England, suffered regular stormwater flooding, with over 100 residential properties and businesses at risk. One of the key overland flow paths into the town centre was along Station Road. The challenge was how to intercept the overland flows from a 100 year storm (1% chance in any given year) on a busy highway and provide a flood storage solution to reduce the flow arriving in the historic town centre. More traditional approaches were not considered viable due to the narrow streets and buildings with shallow foundations. This opened the door to exploring and delivering a more sustainable and resilient solution higher up the catchment, which sought to maximise the benefits to people, place and planet. A landscape vision for the storage area was developed, comprising an amphitheatre as the focal point of the scheme, creating a link to the site’s historical use as a venue for community and festival events. As this was such a popular public park within the town, it was critical to secure buy-in from the community, and so we employed gaming technology to create realistic flythroughs and 3D visualisations to aid in this task. We also filmed a series of short movies to explain how the project worked, to inspire others to follow suit and mimic nature to manage the water more sustainably. This paper will provide an insight as to how the solution was designed and developed to mitigate against climate related shocks and stresses threatening this popular seaside town, whilst also creating a dual-use facility that the community could enjoy all year round.

	[TS4.4] POLDER CITIES IN FOCUS: RESILIENT URBAN FLOOD MANAGEMENT WORLDWIDE 16 June 2026 (Tuesday) 2:00PM – 3:30PM Room 4
	Session Chair: <i>Scott <u>Dunn</u></i> , AECOM (Singapore), <i>Carl <u>Medriano</u></i> , National University of Singapore (Singapore)
>	Hong Kong’s long-term integrated shoreline management strategies to cope with climate change
	<i>Jay <u>Cheng</u></i>, Civil Engineering and Development Department (Hong Kong, China)
	Hong Kong is susceptible to weather-related hazards such as tropical cyclones, storm surges, and overtopping waves due to its geographical locations and climate. Coastal low-lying and windy areas are particularly at risk of seawater inundation from extreme storm surges and overtopping waves, as evidenced by the damage during Super Typhoons Hato (2017) and Mangkhut (2018). With global warming, these extreme events are expected to be more frequent and intensified, such as increased wave height and surge levels. In response, a risk management framework incorporating coastal numerical modeling has been implemented to evaluate coastal hazards and their impacts, guiding short- to medium-term coastal protection works in vulnerable areas. Additionally, a long-term strategic shoreline management study has been conducted to develop guidelines that integrate coastal protection into urban development planning. This strategic approach aims to enhance Hong Kong’s capacity to effectively adapt to the uncertain climate change impacts in future.
>	Rebuild By Design – Resilient Communities Through Innovative Infrastructure
	<i>Christopher <u>Benosky</u></i>, AECOM (United States)
	In 2012, Superstorm Sandy exposed the New York Metro region’s urgent need for stronger, community focused resilience. The Rebuild By Design initiative and the State of New Jersey responded with two landmark efforts, the Hudson River and Meadowlands projects that integrate engineering, urban planning, and Nature based Solutions to meet the community needs. The Hudson River Project layers coastal barriers with public spaces, while the Meadowlands Project restores ecosystems and improves stormwater management, reconnecting flood impacted communities. Together, they show how multi-benefit infrastructure can reduce risk, protect economic vitality, and enhance the quality of life across eight vulnerable communities. This presentation explores how collaborative planning, innovative financing, and adaptive design can redefine infrastructure as a catalyst for resilient, inclusive, and sustainable urban futures, offering lessons for coastal cities worldwide.
>	Beyond Pumps: Integrating Blue-Green Infrastructure for Climate-Resilient Urban Flood Management in New Orleans
	<i>Dustin <u>Atchison</u></i>, Jacobs Engineering (United States)
	Greater New Orleans faces persistent flood risk, with traditional drainage pump stations (DPS) increasingly strained by aging infrastructure, more intense storm events, and the added pressure of shallow groundwater. In neighborhoods like Lakeview, Lake Vista, and Lake Shore, the challenge is to reduce flooding without overburdening the city’s vital pump systems or relying solely on costly grey infrastructure. This project takes a holistic, systems-based approach, blending blue, green, and grey infrastructure—integrating nature-based solutions such as wet ponds, bioretention, and permeable pavements with targeted conveyance improvements. The strategy is designed to be robust and adaptive to the deep uncertainties of climate change, including more frequent and intense rainfall and the dynamics of a system designed to fight against sea level rise. By employing advanced hydrologic and hydraulic modeling and digital tools, we identified and prioritized a suite of projects that not only reduce flood risk but also deliver co-benefits: improved water quality, urban heat island mitigation, and enhanced public spaces. The process included collaboration with city partners, development of a BGSI toolbox, and a transparent scoring system to evaluate hydraulic benefits, cost-effectiveness, community impact, and partnership opportunities. The phased, adaptive implementation plan allows the city to respond flexibly to available funding, evolving climate risks and uncertainties. This paper provides insight into how New Orleans is reimagining flood management as a catalyst for urban resilience and community value. The outcome is a balanced strategy that leverages both engineered and natural systems to create a more sustainable, livable city—demonstrating that flood infrastructure can be as much about people and place as it is about pipes and pumps.

[TS4.5] ADVANCED FLOOD AND COASTAL FORECASTING FOR CLIMATE RESILIENCE 17 June 2026 (Wednesday) 4:00PM – 5:30PM Room 8	
	Session Chair: Tomoya <u>Shibayama</u> , Chuo University (Japan), Jeremy Richardson, Pegasys Limited (United Kingdom)
>	From Data to Decisions: Developing a Machine Learning Flood Forecasting Tool
	Shivasorupy <u>Barthiban</u>, Mott Macdonald (Singapore)
	Recent flood events in New Zealand highlight the ongoing flood hazard which are likely to be exacerbated by climate change. To aid in mitigating flood risks, a real-time flood forecast pilot project has been developed for a rural catchment in the Auckland region, integrating a trained Machine Learning (ML) model into a geospatial platform to rapidly produce flood forecasts in response to live rain data. The pilot is a key initiative in exploring how best to leverage existing datasets and enhance the decision-making capabilities of Council, emergency managers, operators, and the community to better prepare for and respond to flood events. Recent flood events have underscored that flooding hazard will always be a present hazard in New Zealand, evidenced by the January 2023 floods in Auckland, which caused between \$9 - \$14.5 billion in damages (The Treasury, 2023). As the effects of climate change will likely increase the frequency, uncertainty, and severity of extreme weather events, there is an increasing need to plan for and respond to flooding events. There are large amounts of data available to support decision makers, however it can be difficult to interpret or understand incoming data as events occur. Flood warning systems can help make sense of data for Council, emergency managers, operators, and the community. Improved access to data allows for better preparation and response to flood events. Providing additional time to prepare can help to reduce property damage, improve emergency response, allow business time to take protective measures, and encourage emergency preparedness by raising awareness.
>	An operational flash flood warning system for Hanoi
	Guido <u>Vaes</u>, Hydroscan (Belgium)
	This paper describes the combined use of real-time radar rainfall and pre-processed flood maps in order to obtain a best estimate of the real-time flood depths due to flash floods. This system has been adapted to the Vietnamese conditions and implemented for the city of Hanoi as an operational early warning system.
>	Towards Climate-Resilient, Multi-Purpose Coastal Forecasting: A High-Resolution Regional Model for the Straits of Singapore
	Mark <u>Hegnauer</u>, Deltares (Netherlands)
	Singapore is highly exposed to coastal hazards at the confluence of the Indian Ocean, South China Sea and Java Sea. Complex tidal propagation, seasonal water level differences, and storm surges create significant risks, which are expected to increase under climate change. Accurate tide-surge forecasting is essential for coastal protection measures, including movable barriers that depend on timely and reliable predictions. Coastal adaptation is vital for Singapore to address the threats of sea-level rise and the increasing frequency and intensity of storms. Moreover, strong residual currents in the Straits of Singapore (SoS), which modulate salinity intrusion, impact water quality and shape ecological risks for mangroves, seagrass, and corals. To address these challenges, we present the Singapore Regional Model (SRM-FM), developed with Delft3D Flexible Mesh, which resolves complex interactions between tide and surge across the Sunda Shelf and captures variations in residual transport through the SoS. The model domain spans the Malacca Strait to the Gulf of Thailand and Java Sea, with high resolution near Singapore. Validation against tide gauge data demonstrates excellent reproduction of tidal and non-tidal water levels and monthly means. Together with performance of indicators of residual currents, including the response during the Marine Horizon oil spill event, SRM-FM provides a robust basis for flood preparedness, environmental risk assessment, and long-term coastal resilience planning
>	From Prediction to Action: Designing Integrated Flood Resilience with Today’s Earth
	Kei Yoshimura, University of Tokyo (Japan)
	Floods account for nearly one-third of global disaster-related economic losses, yet advances in flood forecasting alone have not consistently translated into reduced impacts. This presentation tells an integrated framework for transforming flood prediction into actionable resilience through the case of the JST MIRAI project in Japan. The initiative centers on Today’s Earth, a satellite-integrated, physically based hydrological forecasting system capable of extending lead times beyond 24–72 hours. However, the core innovation lies not only in improved prediction accuracy but in the simultaneous design of dissemination and decision-enablement mechanisms. We introduce an information-infrastructure integration platform that couples flood simulations with communication and power network emulators to assess real-time information reachability under infrastructure disruption. In parallel, co-design workshops with municipalities embed long-lead forecasts into institutional workflows and preparedness protocols. This integrated approach—prediction, dissemination, and societal response—demonstrates that forecast value depends on its systemic incorporation into governance and operational practice. The case aligns with Sendai Framework Priorities 1, 2, and 4 by strengthening risk knowledge, governance integration, and anticipatory preparedness. The methodology offers a scalable model for regions where satellite-based systems and institutional co-design can bridge scientific forecasting and societal resilience.

[TS4.6] TECHNOLOGY-ENABLED NATURE-BASED SOLUTIONS FOR COASTAL PROTECTION 18 June 2026 (Thursday) 2:00PM – 3:30PM Room 8	
	Session Chair: Chai Teck <u>Ho</u> , PUB, Singapore's National Water Agency (Singapore), Carl <u>Medriano</u> , National University of Singapore (Singapore)
>	SmartCoast: Monitoring Climate Change, Coastal Hazards Risk and Mangrove in Torres Strait with Digital Coastal Management Tool
	Pearlyn <u>Pang</u>, Fugro (Singapore)
	SmartCoast is a digital coastal zone management tool co-designed, developed and applied to monitor climate change impacts in the Torres Strait, with a focus on mangrove ecosystems. This initiative supports the UN Ocean Decade’s vision of using digital twins of the ocean to integrate historical and real-time data, improving understanding of marine environments and informing sustainable management. The Torres Strait, between mainland Australia and Papua New Guinea, is experiencing some of the highest sea-level rise in Queensland. SmartCoast is a collaborative project led by Fugro, with partners including James Cook University, EOMAP, and the Earth Observation Hub (QLD node). It used a co-design approach involving local communities to develop a digital twin for Horn and Thursday Islands. Mangroves in this region are vital for coastal protection, but there is limited baseline data and no ongoing monitoring to assess their health or need for rehabilitation. SmartCoast addresses this by integrating Earth Observation, LiDAR, and high-resolution imagery to deliver a seamless sea-to-land survey path, with a specific focus on mangrove vegetation. The platform provides actionable geo-data to support decision-making, featuring hindcasting and forecasting for climate scenarios and storm events. It is being developed with iterative UI/UX prototyping and adheres to FAIR data principles (Findable, Accessible, Interoperable, Reusable). Verification of mangrove data was conducted with local habitat rangers, enabling classification of mangrove zones (e.g., healthy, threatened, transitional) and assessment of coastal inundation risks. SmartCoast ultimately empowered communities and stakeholders with a user-friendly digital twin that enhances resilience and supports nature-based solutions in the face of climate change.
>	Furthering Multi-Scale Assessment of Hydrodynamical and Structural Influences on Coral Larval Settlement
	Wai Hong Ronald <u>Chan</u>, Agency for Science, Technology and Research (Singapore)
	Resilient hybrid coastal protection solutions require the continued survival of their constituent corals. The coral life cycle can be interrupted by the detachment of settled larvae from their host structures due to breaking waves, strong currents, and sediment exposure. Protective structures can be designed and positioned to promote robust larval attachment. Our multi-scale approach combines lab-/near-pilot-scale experimentation and high-fidelity computational modelling with local ecological considerations to characterise and optimise hydrodynamical and structural effects. We present updates on proposed ocean basin tests to determine wave dissipation induced by low-crested artificial reef structures amid wave-breaking and current-driven turbulence. We also present preliminary comparisons between simulations and measurements of seagrass deformation by flow disturbances. The resulting dynamics are downscaled to an agent-based Lagrangian model simulating the translational and rotational kinematics of individual larvae, including gravitactic motion and roughness interactions, and a parallel Eulerian model for large-scale interactions with turbulent flow and sediment transport.
>	A Systems Dynamics Seagrass Module for Operational Nature-Based Solution in Tropical Coastal Waters
	Felix Gaffu <u>Tandadjaja</u>, National University Of Singapore Department of Civil and Environmental Engineering (Singapore)
	We address a gap in coastal protection modelling where seagrass is often treated as static and driver effects are fragmented. We developed a process-based stock-flow model that integrates light, temperature, and nutrient limitation to simulate the seasonal dynamics of above- and below-ground seagrass biomass and shoot density. The framework adapts established equations from Carr (2012) and Kenov et al. (2013), with forcing variables including photosynthetically active radiation (PAR) and water temperature specific to tropical intertidal sites. Model inputs and parameter ranges were first derived from literature, then refined using a mesocosm experiment with <i>Halophila ovalis</i>. This experiment provided calibration and validation data under controlled light and nutrient regimes, helping to constrain uptake rates, internal nutrient quotas, and biomass response. The model was used to simulate annual seagrass growth under tropical forcing, for application to Singapore coastal waters, comparing a baseline light-temperature scenario with nutrient-enabled runs. These analyses aim to isolate periods and conditions where nutrient supply, not light or temperature is the primary limiting factor, yielding practical threshold bands and habitat-specific guidance for intervention.

THEME 5 : WATER QUALITY AND ONE HEALTH

[TS5.1] ONE HEALTH APPROACHES TO WATER QUALITY AND FAECAL SOURCE TRACKING

15 June 2026 (Monday) | 9:00AM – 10:30AM | Room 5

Session Chairs:

Robert Bos, Independent Consultant (Switzerland), *Peter Grevatt*, Global Water Research Coalition (United States)

> One Water One Health

***Henk Ovink*, Global Commission on the Economics of Water (Netherlands)**

GCEW's central move is to recast water as a global common good and an organizing principle across the economy, rather than as a narrow sector input. That is highly compatible with One Health, which is defined as an integrated, unifying approach to balance the health of people, animals, and ecosystems, using shared governance and cross-sector coordination. In other words, GCEW provides the economics and governance case for integration, while One Health provides the health and risk-management frame.

The watercycle is the shared ecological medium through which One Health operates. The GCEW report emphasizes that the hydrological cycle is deeply linked to biodiversity, climate, food systems, and human well-being, and that treating water as a common good requires collective action and a new social contract. One Health similarly emphasizes interdependence across humans, animals, plants, and ecosystems, including risks such as water pollution, antimicrobial resistance, and waterborne disease. So, the bridge is not just metaphorical; it is grounded in the shared dependency of health outcomes on water systems.

> Risk indicators for operational bathing water quality management

***Indra Fara Leerhoff*, Deltares Singapore Branch (Singapore)**

Pollution discharges in rivers and canals due to high rainfall events can adversely impact coastal bathing water quality. Early warning on potential water quality risks and well informed decisions on gate and pump operations can limit the environmental and health impact of such a pollution event. However, the lack of data makes accurate operational simulation of pollution concentrations often challenging. This study develops operational water quality indicators to facilitate operational management under data scarce conditions, and applies them to a case in Dunkirk, France. Predictive models, developed with Delft3D FM (1D) and D-Water Quality, translate hydraulics to pollutant independent water quality information such as the age of the contaminated water at the outlet structure. The introduction of decay processes based on environmental conditions additionally generates pollutant specific information. The combination of mechanistic models with a data driven approach provides pollutant independent as well as pollutant dependent predictive risk indicators, avoiding calculation of concentrations which makes the approach applicable in operational alert systems where operational water quality data is scarce.

> An integrated approach to tracking faecal contamination to its source: a case study for the river Meuse, The Netherlands

***Gertjan Medema*, KWR Research Institute (Netherlands)**

Peaks in faecal contamination are a cause of concern for drinking water facilities along the Meuse River, The Netherlands. It is not clear what the source of faecal contamination is and therefore unclear how to act. This study uses a combination of continuous, real-time monitoring, microbial source tracking and fate and transport modelling to characterize peaks and track the origin (humane, fowl, cattle) and location of E.coli contamination. The approach is successful in narrowing down the possible locations E.coli contamination may originate from and whether it is from human or animal (cattle, fowl) origin. Furthermore, continuous real-time monitoring enables targeted additional monitoring of coliform bacteria when peaks occur.

> Predicting peak microbial pollution events caused by combined sewer overflows in a source-to-sea system

***Hao Wang*, Deltares (Netherlands)**

Microbial water quality in urban coastal bathing waters is under pressure due to rapid urban population growth and increased occurrence of heavy rainfall events in the summer season. To capture the peak microbiological pollution events in coastal recreational waters caused by combined sewer overflows, we developed a prototype modelling framework by coupling different numerical modelling components to predict pathogen pollution from the initial sources to the ultimate receiving waters. The coupling model consists of rainfall-runoff, emission, hydrology, hydrodynamics and wate quality components. The performance of the coupling model was validated by monitoring data based on a 3-year hindcast (2017-2019) for the Katwijk + Rijnland area in the Netherlands. The monitoring data identified 12 peak pollution events during the simulation period, of which 10, attributed to CSOs, were accurately captured by the model. This coupling model framework provides a useful tool to quantitatively track microbiological pollution throughout an entire aquatic continuum, which could be adapted to an operational forecasting system in future. In addition, climate change and mitigation scenarios can be applied to the coupling model to support climate impact assesment and water management.

	[TS5.2] FROM PREDICTION TO PREVENTION: MANAGING THE QUALITY OF DRINKING WATER SOURCES 16 June 2026 (Tuesday) 2:00PM – 3:30PM Room 5
	Session Chairs: <i>Chee Meng Pang</i> , PUB, Singapore's National Water Agency (Singapore), <i>Joan Rose</i> , Michigan State University (United States)
>	The changing nature of freshwater and marine harmful algal blooms (HABs) and their impact on water treatment in South Australia
	<i>Florence Choo</i>, South Australian Water Corporation, Australia (Australia)
	This study examines historical harmful algal bloom (HAB) trends in South Australian freshwater and marine systems from the 2000s to present, assessing changes in severity, diversity, and persistence, and their impacts on water treatment processes. Using long-term monitoring data and targeted sampling across metropolitan and regional sites, water quality, algal composition, and natural organic matter characterisation were evaluated. Findings reveal blooms are becoming more frequent, prolonged, and diverse, with tropical species emerging in temperate climates. Notable events include a significant taste-and-odour episode (4,200 ng/L) and South Australia’s first marine HAB lasting over seven months, affecting desalination operations. These unprecedented changes raise critical questions about the resilience of current treatment strategies and highlight the need for adaptive approaches to safeguard water quality under evolving climatic and ecological conditions.
>	Nature-Based Approaches for Mitigating Odor (MIB)-Producing Cyanobacteria in Source Water Reservoirs
	<i>Ming Su</i>, Research Center For Eco-environment Sciences, Chinese Academy of Sciences (China)
	China's intensified eutrophication control has unexpectedly paralleled a rise in taste and odor events, primarily caused by 2-methylisoborneol (MIB). A nationwide survey revealed that MIB-producing cyanobacteria (MPCs), overwhelmingly the filamentous species *Pseudanabaena cinerea*, thrive in a moderate phosphorus window (10–50 µg L ⁻¹) that inhibits surface scums and allows subsurface light penetration. High-risk reservoirs are defined by shallow depth (<8.7 m), long retention time (>0.47 years), and this specific trophic state, threatening 21.9% of China's major drinking water reservoirs beyond 2050. Based on these niche and pigment-based traits, we developed and validated targeted, nature-based control strategies.
>	Machine-Learning-Based Prediction of Algal Density Using Algal Volatile Organic Compounds for Bloom Early Warning
	<i>Jia Guo</i>, Tsinghua University (China)
	Harmful algal blooms (HABs) threaten aquatic ecosystems, but predicting algal density accurately remains difficult. Algal volatile organic compounds (AVOCs) may provide earlier bloom signals than conventional indicators. This study developed a novel method integrating proton transfer reaction time-of-flight mass spectrometry (PTR-TOF-MS) with interpretable machine learning to predict algal density via AVOCs. Using datasets of <i>Microcystis aeruginos</i> and <i>Chlorella vulgaris</i> , an extreme gradient boosting model achieved rapid, accurate predictions (R ² : 0.95–0.98), outperforming most environment-based models. Butanal and 2-octenal were identified as key biomarkers; below species-specific thresholds, algal density rose sharply. Transcriptomic and enzymatic analyses revealed metabolic shifts—enhanced photosynthesis, suppressed carbohydrate catabolism, and inhibited fatty acid degradation—reduced these AVOCs. Field tests confirmed the model’s potential (67–81% bloom risk), establishing AVOCs as dynamic physiological indicators and offering a transformative tool for managing HABs.
>	Modeling the Competitive Dynamics of Toxic and Non-Toxic Cyanobacteria with a Dynamic Energy Budget Framework
	<i>Shoya Tanaka</i>, Tohoku University (Japan)
	Dam reservoirs often experience harmful algal blooms (HABs) dominated by cyanobacteria, which threaten water supply when cyanotoxins contaminate the source. How changing environmental conditions influence cyanotoxin production remains unclear, partly because energy and nutrient allocation to toxin synthesis is poorly understood. In this study, we develop a foundational Dynamic Energy Budget (DEB) model for two competing cyanobacterial strains, one toxic and one non-toxic, each with explicit nitrogen and phosphorus reserves. The model links external nutrient conditions to intracellular allocation among maintenance, growth, and toxin production, enabling exploration of emergent growth–toxin trade-offs. Using exploratory parameter sets, we present illustrative simulations of bloom dynamics, toxin accumulation, and strain competition, providing a mechanistic basis for future calibrated studies of toxicity risk in dam reservoirs.
>	Assessment of Discharge Configuration Strategies on Reservoir Hydrodynamics and Water Quality: A 3D Modelling Approach
	<i>Hongjuan Han</i>, PUB, Singapore’s National Water Agency (Singapore)
	Operational discharge strategies in reservoir management are often considered for water quality improvement, yet their effectiveness remains poorly quantified. This study employed a three-dimensional hydrodynamic-water quality model to compare single-output versus dual-output discharge configurations in an inland reservoir. Results demonstrated minimal hydrodynamic variation between scenarios, with velocity field analysis revealing nearly consistent flow patterns. Wind stress emerged as the primary circulation driver, generating surface layer velocities approximately 10-fold higher than near-bottom layers, while operational discharges exhibited limited influence. Passive tracer simulations showed the dual-output scenario produced slightly enhanced northward transport, resulting in total organic carbon (TOC) spatial redistribution without overall reduction. These findings suggest that discharge management may provide localized benefits for specific contexts, while achieving substantial water quality improvements likely requires integrated approaches addressing nutrient loading, in-reservoir treatment, and other complementary management actions.

[TS5.3] INTEGRATING MACHINE LEARNING, SENSORS, AND BIOMOLECULAR INDICATORS FOR WATER QUALITY ASSESSMENT 17 June 2026 (Wednesday) 11:00AM – 12:30PM Room 7	
	Session Chairs: David <u>Cunliffe</u> , SA Water (Australia), Bruce <u>Gordon</u> , World Health Organization (Switzerland)
>	A Cyber-Physical Framework For Real-Time Risk Management
	Daisuke <u>Sano</u>, Tohoku University (Japan)
	To address global water stress and the absolute imperative of safe wastewater reclamation, this presentation details a novel Cyber-Physical System (CPS) framework for real-time risk management in water quality assessment. Traditional virus monitoring relying on biological assays is hampered by high costs and days of delay, meaning effluent is often discharged before risk is determined. By converging biology, physical chemistry, and artificial intelligence, this framework integrates ultra-sensitive physical biosensors with data-driven machine learning "soft sensors." These soft sensors bypass the physical limitations of hardware alone—such as matrix effects, sensor fouling, and prohibitive capital costs—by utilizing easily measurable operational inputs (like pH, temperature, and flow) to predict complex, hard-to-measure biological risks in real time. Validated through a pilot-scale implementation in Sendai, Japan using an Anaerobic Membrane Bioreactor (AnMBR), the predictive modeling successfully estimates the Log Reduction Value (LRV) of target virus indicators like PMMoV. Ultimately, this approach establishes a proactive, HACCP-based automation paradigm that ensures microbial safety, mitigates labor and demographic constraints, and provides a highly scalable, economically viable future for global water security.
>	Optimizing Water Quality Events Detection Using Genetic Algorithms: A Comparative Study of Local and Global Models for Real-Time Monitoring
	Angelia <u>Lau</u>, SUEZ (Singapore)
	This study explores the use of Genetic Algorithms (GA) to enhance water quality (WQ) event detection in Singapore’s reservoirs, supporting urban stormwater management and water self-sufficiency. Building on prior research, the study utilizes a dataset of 278 WQ events across 19 event types from January 2019 to October 2024. GA was employed to optimize feature selection and threshold determination for binary classification of WQ events, leveraging its ability to achieve faster convergence and higher accuracy. The study compares local models (reservoir-specific) and global models (location-agnostic) for event detection. Results show improved detection accuracy and reduced false alert rates compared to the previous study. Local models outperformed global models in True Positive Rate and False Positive Rate, but global models remain valuable for reservoirs with limited data. A real-time monitoring dashboard was developed to operationalize the findings, enabling anomaly detection and forecasting.
>	eDNA meets Toxicity: Deciphering the Relationship Between eDNA Patterns and Toxic Stress in Aquatic Ecosystems
	Frederike <u>Bijlmer</u>, Witteveen + Bos (Netherlands)
	Environmental DNA (eDNA) metabarcoding can provide a holistic snapshot of aquatic community composition, offering a promising “pre-scan” of water quality that integrates effects of chemical stress on biota. A recent Dutch field study combined eDNA food-web analysis with a luminescent bacterial bioassay (<i>Aliivibrio fischeri</i>, “AFB-test”) to assess the link between eDNA profiles and toxic pressure. Although most samples had low measured toxicity, clear site-specific differences in eDNA community structure were observed, and “dirty” sites tended to have distinct assemblages from “clean” sites. No simple linear correlation between AFB toxicity and overall eDNA diversity was found in this dataset, but the highest-toxicity samples showed reduced eDNA richness, suggesting possible ecological impact at strong stress levels. These findings illustrate eDNA’s sensitivity to anthropogenic pressure and its value as a fast, cost-effective complement to chemical and bioassay monitoring.
>	Energy Allocation Dynamics Constraining ARG Transmission Under ZnO Exposure
	Daisuke <u>Sano</u>, Tohoku University (Japan)
	Bacterial communities in aquatic environments are influenced by nutrient fluctuations and metal pollutants, which modulate biofilm formation, stress responses, and plasmid-mediated gene transfer. Biofilm architecture promotes donor–recipient contact, whereas metal exposure can suppress plasmid exchange. Understanding these combined effects is critical for evaluating antibiotic resistance gene (ARG) transmission. This study assesses how zinc oxide (ZnO)–induced metabolic changes influence ARG transfer using a simplified ordinary differential equation (ODE)–based Dynamic Energy Budget (DEB) model. Mobilized energy was allocated to biofilm formation (J_{biofilm}), conjugation-linked ARG transmission ($J_{\text{conjugation}}$), and metal resistance (J_{metal}), supported by 12-hour measurements of biofilm OD_{550}, conjugation efficiency, total organic carbon (TOC), and ATP. J_{biofilm} declined across treatments, $J_{\text{conjugation}}$ showed suppression-including complete inhibition at 0.002–0.005 g/L ZnO- and J_{metal} peaked before decreasing at 60 h. These shifts demonstrate how metal stress restricts the energetic capacity for ARG transmission, supporting antimicrobial resistance (AMR) risk assessment.
>	Application of Machine Learning (ML) Techniques for Water Quality Assessment in a Water Treatment Plants
	Lindelwa <u>Ndhlovu</u>, Department Of Water And Sanitation (South Africa)
	Access to clean water remains a major challenge in many developing countries, including South Africa, due to overpopulation, pollution, and limited infrastructure. Gauteng Province relies on Rand Water, the continent’s largest water utility, which generates large amounts of underutilised sensor data. This study investigates the use of machine learning (ML) to analyse turbidity data (NTU) from four filter houses and support infrastructure management. After cleaning and preprocessing the data, models were built using MLP-ANN, LSTM, random forest (RF), and support vector regression (SVR). Model performance was assessed using RMSE, MSE, and R^2. While all models performed well in terms of RMSE and MSE, LSTM achieved the highest R^2 (0.522), indicating stronger predictive performance. Overall, the study demonstrates the potential of ML to enhance water quality monitoring and filter house management.

[TS5.4] RESILIENT AND SUSTAINABLE WATER AND SANITATION SOLUTIONS FOR PUBLIC HEALTH PROTECTION 18 June 2026 (Thursday) 9:00AM – 10:30AM Room 7	
	Session Chairs: <i>Ruchika <u>Shiva</u></i> , IRCWASH (India), <i>Gertjan <u>Medema</u></i> , KWR Water Research Institute (Netherlands)
>	Resilient and Sustainable Water and Sanitation Solutions for Public Health Protection
	<i>Jay <u>Bhagwan</u></i> , Water Research Commission (South Africa)
>	Reliable and Robust Solar-Powered Water Treatment Creates Sustainable Solutions for Rural Communities in Indonesia
	<i>Andrew <u>Shaw</u></i> , Black & Veatch (United States)
	Rural water treatment systems face challenges with sustaining their use and upkeep. In this paper a successful and robust system developed by the NGO Water Mission is described. Their system includes solar-powered pumping, a novel erosion chlorinator to ensure the water is disinfected and safe, and the use of remote surveillance to check system integrity. With over 200 projects in Indonesia, this paper includes details of one successful project in Oenoni II, located in East NUnited States Tenggara (NTT), which is one of Indonesia’s driest provinces. The success of this project is demonstrated by people using this water source not just for drinking and handwashing, but many other uses including farming, cooking, and bathing.
>	Building Climate Resilience in the Sanitation Value Chain through Water Efficient Sanitation Systems (WESS)
	<i>Phillip <u>Majeke</u></i> , Water Research Commission (South Africa)
	Approximately 3.6 billion people lack access to safely managed sanitation around the globe, of which many in areas vulnerable to climate related hazards. Climate change exacerbates risks such as flooding, drought and disease spread, threatening progress in sanitation access made over the years. The Water Research Commission of South Africa (WRC), through the South African Sanitation Enterprise Programme (SASTEP), is evaluating water efficient sanitation systems (WESS) for climate resilience using the ClimateFirst Framework which was developed by Institute of Sustainable Futures, University of Technology Sydney. Results show high resilience rating of WESS due to features like water efficiency, offgrid and adaptability. These WESS align with climate adaptation and mitigation goals, offering sustainable solutions for resilient sanitation systems in changing climate conditions.
>	Climate Resilience, Mitigation and Public Health: Measurement and Modelling of Safely Managed Sanitation Services in Indonesia
	<i>Juliet <u>Willetts</u></i> , University of Technology Sydney (Australia)
	Indonesia has made commitments to increase safely managed, climate resilient sanitation following city-wide inclusive sanitation approach (CWIS) and to reduce greenhouse gas emissions as part of its Nationally Determined Contributions (NDCs). This paper presents work of a collaboration between Ministry of Public Works, Australian Government’s Partnership for Infrastructure and an academic consortium. The objectives were to measure emissions from diverse sanitation systems, develop a national emissions estimate for the wastewater sector and undertake policy engagement. Measured emissions rates were median 2.9 gCH ₄ /cap/day [95% CI 2.31 – 3.70] in onsite systems, and 7.5-144 g N ₂ O–N/cap/yr from aerobic processes in centralised wastewater systems. A modelled national estimate and future scenarios for safely managed sanitation informed policy and technical recommendations. To achieve safely managed, climate resilient sanitation services and mitigation outcomes, the study recommended actions along the entire sanitation chain, including improved technical quality and regular desludging of onsite systems, faecal sludge facilities equipped with methane recovery and resilient to climate hazards and optimisation of wastewater treatment processes.
>	Broad and Long-term Potential of Ammonia for Virus Inactivation in Non-sewered Sanitation System
	<i>Putri Shafa <u>Kamila</u></i> , Tohoku University (Japan)
	Non-sewered sanitation system is increasingly recognized as practical solutions to achieve safe sanitation targets, yet their performance is limited by poor construction and delayed emptying process, which facilitate waterborne pathogens transmission, particularly viruses. Ammonia is known as an in-situ sanitizer for virus inactivation in this system, where cost-effective and reliable disinfection is essential. However, its long-term efficacy remains uncertain, as viruses can rapidly adapt to environmental stress. This study investigated the inactivation and adaptation of murine norovirus to ammonia. A 3-log reduction was achieved with 400 mM ammonia after 90 minutes, and no resistant populations emerged after 10 serial passages, unlike using chlorine and lime. The possible explanation is its inactivation mechanism that primarily causes genome damage. To examine whether this mechanism is sequence dependent, eight genome regions were tested, and all were susceptible. Overall, this study provides new insights into ammonia’s broad and long-term potential in sanitation systems.
>	Identification of Potential Infectious Disease Biomarkers for Wastewater-Based Epidemiological Surveillance
	<i>Luyao <u>Wang</u></i> , Tohoku University (Japan)
	Wastewater-based epidemiology has great potential to act as a complementary tool for epidemiological surveillance. Compared to nucleic acid-based approaches, protein biomarker detection offers a compelling alternative, providing broader pathogen coverage and reflecting community health status. This study aimed to identify protein biomarkers associated with specific infectious diseases and as well as indicators of the overall infectious diseases burden. We analyzed temporal protein dynamics in wastewater and examined their association with clinical case data. We observed a correlation between purine nucleoside phosphorylase detected in wastewater and reported influenza A cases. Beyond host-derived signals, non-human proteins revealed insights into gut-lung axis and viral-induced dysbiosis. Furthermore, we demonstrated the potential of diverse immune markers (e.g., alpha-1-acid glycoprotein 1 and complement C3) as robust indicators of total infectious disease burden.

[TS5.5] EMERGING CONTAMINANTS IN WATER SYSTEMS: OCCURRENCE, ASSESSMENT, AND RISK MANAGEMENT 18 June 2026 (Thursday) 2:00PM – 3:30PM Room 9	
	Session Chairs: <i>Fiona <u>Waller</u></i> , Independent Consultant (United Kingdom)
>	Risk assessment and management of per- and poly-fluoroalkyl substances in drinking water in New South Wales, Australia
	<i>Paul <u>Byleveld</u></i>, New South Wales Health (Australia)
	All water utilities in New South Wales (NSW) must have a drinking water management system based on the Australian Drinking Water Guidelines. The management system should identify and manage risks. Since 2015, several water utilities have identified and managed per- and polyfluoroalkyl substances (PFAS) contamination risks. The National Health and Medical Research Council first published PFAS guideline values in 2018, and then began a review in 2023, publishing updated values in 2025. NSW Health has recommended since 2019 that water utilities assess risks from contaminants such as PFAS in their catchments and monitor any identified risks. This risk-based approach is consistent with the Australian Drinking Water Guidelines. In 2024, NSW Health provided funding for water utilities to screen for PFAS. Funding continued in 2025 for testing of each raw water source and treated drinking water. The statewide assessment of PFAS in drinking water found most water supply systems complied with the updated guideline values. Responses to elevated results were rapid, effective and ensured each supply complied with the updated guidelines when published.
>	Organofluorine sum parameters for signalling PFAS burdens in environmental waters
	<i>Rockson <u>Liu</u></i>, National University Of Singapore (Singapore)
	Per- and polyfluoroalkyl substances (PFAS) are high-profile contaminants, many with pervasive presence and long persistence in environmental waters. Conventional monitoring relies heavily on targeted LC-MS/MS, which measures only a small “visible fraction” of PFAS and leaves substantial gaps in the mass balance of total organofluorine. In this study, we applied three sum parameters, namely adsorbable organic fluorine (AOF), extractable organic fluorine (EOF), and total oxidisable precursors (TOP), alongside targeted HPLC-MS/MS for 48 PFAS in watercourses of various urban land use to capture unidentified and transforming organofluorine. AOF quantifies a broad range of organofluorine, including PFAS and many non-PFAS fluorinated chemicals, that adsorb to activated carbon. EOF, derived from weak anion exchange-solid phase extraction (WAX-SPE), enriches mainly polar and anionic PFAS. The TOP assay identifies oxidisable precursors contributing to terminal perfluoroalkyl acids. Combining these sum parameters reveals spatially distinct PFAS burden by groups shaped by land-use inputs and hydrological connectivity. Overall, group-based sum parameters provide integrative metrics for rapidly assessing PFAS groups of concern as a practical alternative to laborious compound-by-compound analysis.
>	An Integrated SWAT-Based Framework Using Global Datasets to Simulate Emerging Contaminants Across Multiple Watersheds
	<i>Marcus Joseph <u>Sanchez</u></i>, Tohoku University (Japan)
	This study evaluates an integrated, globally transferable modeling framework designed to estimate emissions and establish baseline concentrations of two representative Emerging Contaminants (ECs), PFOA and PFOS, in two different watersheds. Using the latest SWAT+ platform and harmonized global datasets, the framework was applied to the Natori River watershed in Japan and extended to the Kelani River watershed in Sri Lanka to assess its performance in data-limited regions. The model incorporates long-term weather data (2001–2025), updated global land use, soil, elevation and population data to estimate daily flow and PFAS emissions using population-based methods derived from Lindim et al 2015. In both watersheds, the updated framework improved spatial representation of sub-basin boundaries and refined emission estimates, particularly in areas influenced by wastewater infrastructure, industrial activity, and dense urban land use. Emissions in the Natori watershed ranged from 0.02–10 g/day, with most sub-basins contributing less than 1 g/day. GDP-adjusted estimates for the Kelani watershed yielded higher emissions (1–28 g/day), reflecting greater population or other sources despite conservative per-capita assumptions. Hydrological performance was generally reasonable for average flows but showed reduced accuracy during high-flow periods. These discrepancies highlight persistent challenges in representing extreme-event hydrology and their influence on PFAS transport, reinforcing the need for detailed calibration and integration with local monitoring data. Despite these limitations, the framework demonstrated strong transferability and produced results consistent with limited measured values in Japan. It also identified clear regions in both watersheds which may need further investigation, confirming its utility for preliminary screening and prioritization. By leveraging globally accessible datasets and a standardized workflow, the framework provides an accessible decision-support tool for establishing PFAS baseline conditions and supporting comparative assessments under a One Water–One Health perspective. It also offers a scalable foundation for future evaluations of additional PFAS and other emerging contaminants.
>	Occurrence and Distribution of Polymer Additives in Tropical Urban Water Bodies
	<i>Zhixin <u>Li</u></i>, National University Of Singapore (Singapore)
	Polymer additives, widely used in plastics, rubbers, and coatings, are an emerging class of contaminants. They can enter surface waters through urban runoff and persist or transform into products of potential concern. Yet their occurrence and distribution under tropical hydrological conditions remain poorly understood. This study examines 27 polymer additives across different catchments in Singapore, spanning both the inter-monsoon and monsoon seasons. Targeted HPLC–ESI/APCI–MS/MS analysis with isotope dilution and stringent QA/QC validation ensures reliable quantification. Using monthly observations across contrasting catchments, we resolve spatial and seasonal concentration patterns and co-detection structure, and compile a curated, class-resolved dataset for tropical water bodies. This dataset is intended to support surveillance design, indicator selection, and prioritization of polymer additives in the urban water cycle, and to integrate chemical-quality evidence into urban water-management decisions.

>	Developing the Proof Of Concept digital twin for modelling plastic waste movement in Pasig River, Philippines
	Rudolph <u>Peralta</u>, Arup (Philippines)
	The Pasig River in Metro Manila is a major global source of Plastic pollution in the Pasig River is a critical environmental and social challenge, with the river contributing over 6% of global ocean plastic waste from rivers. The impacts of plastic waste are far-reaching, affecting water quality, aquatic ecosystems, and the health and livelihoods of communities along the riverbanks. In response to the Asian Development Bank’s Discovery Space Challenge, Arup developed a scalable digital twin to provide actionable insights for plastic waste management. The digital twin integrates geospatial, environmental, and socio-economic data, enabling identification of pollution hotspots, waste types, and contributing activities. This initiative is not only a technological advancement but also a catalyst for positive change in waterway health and community well-being ocean plastic pollution. Leveraging digital twin and AI-Machine Learning models, this project enables real-time monitoring and predictive analysis of plastic waste flows. The outcomes include improved waterway health and tangible benefits for local communities, such as reduced flooding, enhanced public health, and increased engagement in environmental stewardship. Highlights • Developed an open-source digital twin for the Pasig River to monitor plastic waste and inform interventions. • Applied AI-ML models (YOLOv8/YOLOv11) for plastic type detection with over 88% accuracy. • Identified plastic hotspots and seasonal trends using time-lapse camera data. • Enabled predictive modelling for waste accumulation and cleanup logistics, supporting better waterway health. • Fostered community engagement and improved quality of life through cleaner waterways. The wider benefits of the project have given agencies within the Philippine government a demonstration of how digital twins can enhance their management of the water/built environment and catalysed action to developing and sharing datasets for the wider public good.

THEME 6 : NEXUS & RESOURCE CIRCULARITY

[TS6.1] RESOURCE RECOVERY (1)

15 June 2026 (Monday) | 2:00PM – 3:30PM | Room 6

Session Chairs:

Wilbert Menkveld, Nijhuis Saur Industries (Netherlands), Dr Huang Sheng, National University Singapore (Singapore)

> Recovering resources scale-up and practice: Closing loops and keeping value where it belongs – the Water Sector

Ana Soares, Cranfield University (United Kingdom)

Nutrient and carbon valorisation in wastewater treatment plants has moved forward significantly in the last few years, driven by net-zero targets and sustainability principles addressing all three pillars: environment, society and economy. Emerging initiatives are making this shift more practical, moving from concepts and lab-scale observations to pilot-scale installations with real scale-up potential. Key investigations focus on anaerobic wastewater treatment, ammonia management through ion exchange and membrane contactors, crystallisation, and bio-mineral phosphorus removal. Large demonstration plants at two UK utilities validate anaerobic wastewater treatment, offering key advantages of zero aeration costs and sludge production reduced by more than 90% when compared with conventional activated sludge. On nutrients, pilot-scale investigations have achieved 90–95% nitrogen removal, while bio-mineral phosphorus removal (BMPP) processes can recover phosphate from wastewater and urine with recoveries >95%. The products, ammonium sulphate solutions and bio-struvite, are high-purity and can be fed back to the water utility as valuable products closing loops and keeping value within the water sector. As carbon taxes and nutrient limits tighten, and recovery from sludge and wastewater becomes a regulatory priority, key technologies offer a more circular and resource-focused future for the water sector.

> From Waste to Worth: Transforming Biosolids to Biochar by Pyrolysis

Sion Brackenbury, Terraflux Soil Solutions Ltd (United Kingdom)

The water sector faces urgent challenges in managing biosolids while advancing decarbonisation goals. Traditional disposal methods, particularly land application, are increasingly unsustainable due carbon release, not to mention contaminants such as pharmaceuticals, heavy metals, microplastics, and PFAS. This study demonstrates the potential of carbonising biosolids into biochar as a circular, low-carbon solution. The research was conducted in three phases: feasibility scoping, scaling-up for operational viability, and assessing the carbonisation of additional wastewater treatment plant (WWTP) waste streams. Carbonisation was performed using Terraflux's Demonstration Carbonisation System, supported by emissions management technologies. Results show that a 50:50 biosolid-to-woodchip blend yields the most commercially viable biochar, delivering a 61% volume reduction and stable autothermal operation. The derived biochar achieves significant environmental benefits:

- Carbon sequestration.
- Contaminant mitigation: 83% reduction in microplastics, complete PFAS elimination, 78% reduction in PAHs, and effective immobilisation or volatilisation of heavy metals.
- Nutrient recovery, with enhanced phosphorus, potassium, and nitrogen content compared to raw biosolids. While other blend ratios produced instability or lower yields, the 50% blend met European Biochar Certificate (EBC) standards as a basic material.
- Supplementary waste streams, though lower in calorific value, also produced high-ash biochars with potential as beneficial additives.

In conclusion, carbonisation of biosolids is a viable, implementation-ready technology that supports regulatory compliance, reduces biosolids volumes by up to 90%, and contributes to Net Zero objectives. Its ability to simultaneously manage waste, sequester carbon, and neutralise emerging pollutants makes it a transformative approach for sustainable wastewater management and circular economy integration.

> Selective Electrochemical Recovery of Ammoniacal Nitrogen from Municipal Sidestreams

Ethan Curling, Roca Water (United States)

Municipal wastewater sidestreams, particularly centrate produced during sludge dewatering, contain some of the highest ammonium concentrations in the treatment process. When recirculated to biological treatment, these streams drive eutrophication, increase aeration energy demand, and contribute to nitrous oxide emissions. Global ammonia production remains closely tied to the energy- and carbon-intensive Haber-Bosch process. Technologies that recover ammonium rather than destroy it therefore represent a meaningful opportunity to reduce nutrient pollution and support low-carbon fertilizer pathways. However, existing sidestream treatment methods, such as air stripping, ion exchange, and membrane-based separations, often require substantial chemical inputs or membrane maintenance, limiting adoption. This work evaluates a membrane-free electrochemical platform that uses intercalation electrodes to selectively capture and recover NH_4^+ through reversible redox-driven insertion. Selectivity is governed by electrode crystal structure rather than ion-exchange membranes, enabling a simpler, materials-driven separation process. The objectives of this study were to (i) demonstrate long-term operational stability in both pure ammonium chloride and synthetic wastewater, (ii) quantify NH_4^+ selectivity across representative $\text{Na}^+:\text{NH}_4^+$ ratios, and (iii) validate stepwise concentration of recovered ammonium. Galvanostatic cycling was performed in a three-electrode configuration, with specific capacity, coulombic efficiency, capacity fade, and selectivity coefficients calculated from electrochemical and ion-analysis data. The intercalation electrode achieved more than 1000 hours of stable cycling in high-purity NH_4Cl and more than 400 hours in synthetic wastewater with minimal capacity loss, indicating robust structural durability. Selectivity decreased with increasing $\text{Na}^+:\text{NH}_4^+$ ratios, consistent with competitive intercalation behavior, but remained favorable under conditions representative of centrate and digestate. Sequential charge-discharge cycles produced a fivefold concentration increase in the recovery electrolyte. These findings demonstrate the technical potential of intercalation-based electrochemical systems for ammonium recovery, offering a pathway to reduce nitrogen emissions, enable circular resource use, and support decarbonized fertilizer production. Ongoing testing with real municipal centrate is showing promising early results.

> When You Call Toilet Paper Your Home: WWTP recovered cellulose as a secondary raw material.

María M. Micó Reche, Acciona (Spain)

Led by ACCIONA's Construction division, the ICARUS project aims to demonstrate innovative technologies to enhance the recovery and use of Secondary Raw Materials (SRM) in construction—a sector responsible for 50% of extractive flows and over 35% of waste in the EU. The project focuses on three key by-products: lithium aluminosilicates, cellulose from urban wastewater and absorbent hygiene products (AHP), and steel slag. ACCIONA's Water division contributes to this project by assessing the feasibility of the recovery of cellulose from wastewater treatment plants (WWTPs). An estimated 4.3 million tons of cellulose from used toilet paper reach WWTPs annually in the EU, significantly

	impacting treatment costs and energy use. Recovering this cellulose while preserving its structure could offer a sustainable SRM source for construction market, while can also reduce treatment expenses on wastewater facilities. ICARUS will assess the viability of separating primary sludge using a rotating belt filter, where more content of unaltered cellulose can be found. It will also explore previously unaddressed issues such as emerging contaminants content in that recovered cellulose, since in the Catalonia-based WWTP where the project has one of the demo cases, 16 pharmaceuticals, polyethylene microparticles, and metals like Al, Ba, and Zn have been already detected. The project will monitor and remove these substances during the recycling process, which will be followed by sterilization and drying. Recovered cellulose fibers are expected to be used in construction as a substitute for polypropylene microfibers in concrete flooring, reducing reliance on virgin raw materials while maintaining high quality standards. SWWI will serve as a platform to showcase ICARUS’s early results, circular economy business models in wastewater treatment, and the potential of cellulose recovery—a largely untapped resource in the water sector.
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	[TS6.2] RESOURCE RECOVERY (2) 15 June 2026 (Monday) 4:00PM – 5:30PM Room 6
	Session Chairs: <i>Wilbert <u>Menkveld</u></i> , Nijhuis Saur Industries (Netherlands), Dr Huang Sheng, National University of Singapore (Singapore)
>	Hydrogen and Wastewater: Aligning Theoretical Synergies with Practical Realities in Co-Located Electrolysis Systems
	<i>Kate <u>Murphy</u></i>, Nicholas O'Dwyer (Ireland)
	This study evaluates the practical implications of integrating oxygen reuse at green hydrogen plants co-located with wastewater treatment plants (WwTPs) in Ireland. Co-locating electrolysis with WwTPs offers circular-economy benefits, including the use of treated wastewater as feedwater and the potential reuse of oxygen by-products to supplement aeration or ozone-based treatment processes. While theoretical models and pilot studies suggest improvements in treatment efficiency, energy savings, and operational cost reductions, empirical evidence from full-scale systems is limited. Review of Irish regulatory frameworks highlights stringent hydrogen–oxygen co-handling requirements, while techno-economic analysis shows that perceived benefits can be offset by additional capital and operational costs. Practical deployment therefore depends on site-specific operational conditions, robust safety management, and economically feasible systems. The study underscores the importance of targeted feasibility assessments that reconcile theoretical potential with real-world constraints, providing a pathway for safe, efficient, and context-appropriate oxygen valorisation in co-located hydrogen–WwTP systems in Ireland.
>	Treated Effluent Reuse in the Green Hydrogen Industry
	<i>Eveline <u>Ekklesia</u></i>, Ramboll (Singapore)
	The use of alternative water sources specifically reclaimed water for non-potable water demand in industries brings great opportunities for the water sector to mitigate global water stress. At the same time, globally increasing Power-to-X (PtX) developments in the energy sector bring along significant additional demand for the water sector. An ultrapure water volume of approximately 200,000 m³/h is needed to produce 1000 GW green hydrogen, and additional cooling water will be necessary too. Water resource management for PtX is therefore important for both the water and energy sectors to achieve net-zero emissions. Life cycle assessment (LCA) was conducted for treatment technologies options to upgrade secondary treated effluent for use in PtX facilities and other industries. It was found that combination of nanofiltration (NF) and reverse osmosis (RO) has lower CO₂-eq footprint compared to combination of ultrafiltration (UF) and RO.
>	Nanofiltration for Selective Monovalent Ion Separation and Recovery of Valuable Resources from Complex Liquid Mixtures
	<i>Jihoon <u>Cheon</u></i>, Toray Advanced Materials Korea Inc. (South Korea)
	The rising demand for valuable resources such as lithium, fueled by the electric vehicle boom, necessitates advanced recovery technologies from unconventional sources such as salt lake brines and spent lithium-ion batteries (LIBs). These sources contain diverse impurities and exhibit extreme pH conditions, rendering conventional membranes ineffective due to insufficient pressure resistance, chemical durability, and selectivity. This study aims to address these limitations by developing two nanofiltration (NF) membranes: one with high-pressure tolerance and another with superior monovalent ion selectivity and chemical stability. The pressure-resistant membrane showed minimal flux decline under high-pressure load, while the pH-stable membrane sustained >98% MgSO₄ rejection under pH <1 and pH 13 exposure. A NF system was also designed to selectively recover lithium from sulfuric acid leachates. This system demonstrated controllable and efficient separation, supporting its practical applicability in battery recycling. Overall, the developed membranes contribute to circular resource recovery and the creation of a sustainable lithium supply chain.
>	Lithium recovery from seawater desalination brines using ion-sieve electrospun nanofibrous membranes: the role of nanofiber design
	<i>Muhammad Naeem Bin Muhammad Nadzri</i>, Nanyang Technological University (Singapore)
	The growing demand for lithium (Li) is driving interest in sustainable extraction from non-traditional resources such as seawater reverse osmosis (SWRO) brines, where Li occurs at sub-mg L⁻¹ levels alongside orders-of-magnitude higher Na⁺, Mg²⁺, Ca²⁺ and K⁺. This work evaluates ion-sieve electrospun nanofibrous membranes as a low-energy, modular side-stream unit for Li recovery and brine valorisation in SWRO plants. We synthesised H_{1.6}Mn_{1.6}O₄ (HMO) and H₂TiO₃ (HTO) lithium ion-sieves in three membrane morphologies – direct-blend (DB), mesoporous (MP) and electrospray (ES) – to tune adsorbent distribution, pore structure and accessibility. DB membranes embed powders within dense PAN nanofibres, MP membranes introduce accessible pores via sacrificial polymer elution, while ES architectures create an ion-sieve active layer over a nanofibrous supporting layer. MP HMO/PAN membranes achieved higher Li uptake than the intrinsic powder adsorbent and delivered an 82.7-fold enrichment of Li from SWRO brine, while concentrating 3.7 times more Li in the first cycle than an equal-mass HMO packed bed. Static tests highlighted a trade-off between HTO's higher Li selectivity and slower kinetics relative to HMO, whereas dynamic breakthrough experiments identified MP HMO/PAN as the optimal configuration. High separation factors against Na⁺, Mg²⁺, Ca²⁺ and K⁺ and stable performance over multiple adsorption–desorption cycles demonstrated excellent selectivity, robustness and reusability. Overall, the study shows how nanofibre morphology design can overcome diffusion limitations in granular ion-sieves and provide a scalable, low-energy pathway to integrate Li recovery into SWRO brine management, supporting more circular and climate-resilient water–energy systems.

	[TS6.3] NATURE-BASED SOLUTIONS 16 June 2026 (Tuesday) 2:00PM – 3:30PM Room 6
	Session Chairs: <i>Dragan <u>Savic</u></i> , KWR Research Institute (Netherlands), Dr Huang Sheng, National University of Singapore (Singapore)
>	Nature-Based Solutions for Resilient, Liveable Cities – A Case Study on Cannery Creek
	<i>Adam <u>Cullen</u></i>, SMEC (Australia)
	Urban wastewater and stormwater systems are increasingly challenged by population growth, climate variability and the limits of conventional grey infrastructure. Nature-based solutions (NBS) can provide cost-effective alternatives, delivering multiple benefits across environmental, social and economic dimensions. The Cannery Creek project in Brisbane, Australia demonstrates an innovative, multi-layered approach that integrates nutrient offsets, creek regeneration, sediment basins, wetlands and bioretention basins to reduce wet weather overflows and improve water quality. The anticipated outcomes are significant: an estimated 96% reduction in property overflows, removal of over 210000kg/yr of contaminants, and AUD20M in savings compared with traditional infrastructure. Additional benefits include 60,000m² of riparian rehabilitation and 2km of new public walkways, enhancing community amenity. The project highlights the importance of innovative licensing pathways, stakeholder collaboration, and robust monitoring frameworks and offers a transferable model for utilities and regulators globally seeking to embed NBS and resilience into urban water management
>	Qianwan Park: A Nature-Based Catalyst for Climate Resilience in the Greater Bay Area
	<i>Claudia <u>Yu</u></i>, Arup (United Kingdom)
	Qianwan Park is a 32.4 hectares river revitalization project along Shenzhen’s reclaimed coastline, setting a new benchmark for resilience in the Greater Bay Area (GBA). Strategically located between Qianhai Bay and Da Nan Mountain, it establishes a green-blue corridor that protects the existing community from floods while restoring ecological connectivity across the district. The design incorporates floodable open spaces, water-efficient planting strategies and sponge city systems for stormwater management. As a living laboratory for sustainable coastal design, nature-based design elements are integrated into passive open spaces, creating 1.6 hectares of new learning areas for public education. In addition, Qianwan Park introduces 3 km of new mangrove habitat to enhance the site’s amenity and ecological value. This initiative demonstrates how integrated water management can transform vulnerable shorelines into resilient, ecologically rich community assets. Engineered to withstand a 1-in-200-year flood event, the park integrates nature-based strategies to restore habitats and enhance resilience. Key works include 70% embankment upgrades using living shorelines with mangroves and water-tolerant plants for erosion control. The park achieves 88% green coverage, features 1.6 hectares of zero-irrigation tree planters saving 500,000 liters of water weekly, and incorporates floodable terraces, intertidal mudflats, and permeable wildlife gardens, with 20% of functional spaces designed to be floodable.
>	Developing a Business Case Framework for Small-Scale Coastal Nature-Based Solutions
	<i>Joost <u>Buurman</u></i>, Haskoning (Singapore)
	There is a large funding gap for nature-based solutions to restore ecosystems, especially in coastal regions of low- and middle-income countries. Much of the available financing supports larger projects, leaving small-scale nature-based solutions facing persistent barriers. Structured business cases can help overcome these challenges by linking ecological restoration to sustainable economic and social value creation. This study presents a framework for business case development, synthesising global best practices and practitioner interviews, piloted under the Bintan Resilient Horizons project in Indonesia. The framework comprises six iterative steps: defining purpose and scope, resource mapping, stakeholder assessment, benefit and cost assessment, risk assessment, and value-stream financing. Successful business cases integrate ecological, social, and economic dimensions, embed value capture mechanisms such as eco-tourism, aquaculture, and carbon credits, and rely on participatory governance. While financial sustainability remains a challenge, well-structured business cases can mobilise diverse funding streams, build investor confidence, and secure long-term community benefits.

	[TS6.4] POLICY & PLANNING FOR CIRCULARITY 17 June 2026 (Wednesday) 9:00AM – 10:30AM Room 2
	Session Chairs: <i>Heather <u>Smith</u></i> , Cranfield University (United Kingdom)
>	Circular water cities – Who is winning in water reuse and why? A comparison of Australian Cities
	<i>Celeste <u>Morgan</u></i>, Arup (Australia)
	A circular economy lens on our urban water systems reveals that a ‘take-use-dispose’ linear water system – where cities produce much more water ‘waste’ in the form of wastewater and stormwater compared to the water they demand. This is a major opportunity to drive value through large-scale reuse to enhance water security, reduce pollution, and support resilient, liveable environments. This paper benchmarks major Australian cities on their current water circularity, exploring opportunities for future reuse to service existing and future urban areas, or support greening, agriculture, and emerging economies like data centres and hydrogen production. It brings together insights on why cities are making progress and the key opportunities to ‘leap-frog’ to drive greater urban water circularity.
>	Enabling Water-Efficient Sanitation Systems (WESS) through Policy and Regulation: Lessons from South Africa’s policy trajectory
	<i>Phillip <u>Majeke</u></i>, Water Research Commission (South Africa)
	South Africa has been advancing its water and sanitation policy framework to enable Water-Efficient Sanitation Systems (WESS) in response to challenges faced by the country as it relates to water stress, climate change and service provision inequalities. From the 1994 White Paper on Water Supply and Sanitation, which highlights the need for eco-friendly technologies, to the 2025 Revised Compulsory Norms and Standards, the policy trajectory has consistently supported decentralized, innovative and resource efficient sanitation systems. The regulatory initiatives including, regulations to entrench water efficient sanitation solutions in bulk services (2024), off-grid sanitation municipal by-laws (2025), the Amended Green Drop incentive based regulation (2024), the National Sanitation Integrated Plan (2024), the National Faecal Sludge Management Strategy (2023), and the draft SANS 30500 Certification Scheme, are paving a way for adoption of WESS in South Africa. This paper highlights South Africa’s policy and regulatory trajectory and its relevance for global sanitation reforms, providing a replicable model for countries pursuing sustainable sanitation service provision in water-scarce and climate-vulnerable contexts.
>	From Outlook to Action: Insights from the Asian Water Development Outlook 2025 on Asia-Pacific’s Path to Water Security by 2040
	<i>Maria <u>Tran</u></i>, Asian Development Bank (Philippines)
	The Asian Water Development Outlook (AWDO) 2025 is Asian Development Bank’s flagship index of water security in Asia and the Pacific. It benchmarks progress across 50 countries using five dimensions: rural household, economic, urban, environmental, and disaster-related water security. Population-weighted indicators and country assessments highlight gains in rural and urban WASH access, while economic productivity and environmental resilience remain constrained by financing, governance, and climate risks. The 2025 edition introduces thematic lenses on glacial melt, gender, and heat stress to anticipate emerging pressures. Findings offer actionable guidance for governments and partners to strengthen integrated water resource management, close investment gaps, and accelerate resilience-building.

	[TS6.5] CIRCULARITY FRAMEWORKS 17 June 2026 (Wednesday) 4:00PM – 5:30PM Room 9
	Session Chairs: Adam <u>Lovell</u> , WSAA (Australia), Meibo <u>He</u> , National University of Singapore (Singapore)
>	Weighing up the options: Addressing uncertainty for the sustainable management of biosolids
	Erin <u>Cini</u>, Water Services Association Of Australia (Australia)
	In this collaborative study, 20 established and emerging biosolids management approaches were explored. Utilities are increasingly required to navigate complex and shifting conditions, from evolving regulations and public expectations to market volatility and emerging contaminants. To support robust decision-making, this project developed a Sustainable Biosolids Management Assessment Framework, enabling utilities to weigh up management options across plausible futures. The framework empowers utilities to build resilience, and maximise the long-term value of biosolids in supporting a circular, low-carbon future. The study has informed the next step in applying adaptive pathways, by utilitising this assessment, and identifying viable markets and development needs to future-proof biosolids management.
>	Sustainability Analysis of Ammonia Removal and Recovery at Used Water Treatment Plants
	Arjen <u>van Nieuwenhuijzen</u>, Witteveen+Bos(Netherlands)
	Amid growing environmental awareness, circular economy objectives, and increasingly stringent regulatory frameworks targeting climate-neutral wastewater treatment, water authorities are actively exploring sustainable approaches for nutrient removal and resource recovery from municipal effluents. One promising strategy involves the treatment of digested sludge reject water, commonly referred to as side stream treatment, which offers potential for enhanced nitrogen management and simultaneous resource recovery. Despite the widespread application of biological nitrogen removal processes such as partial nitrification/anammox (PN/A), a comprehensive environmental comparison with emerging nitrogen recovery technologies, including ammonia stripping and bipolar membrane electrodialysis (BPMED), remains lacking. In this article, a life cycle assessment is being described to compare the sustainability and environmental impact of biological nitrogen removal to physical-chemical nitrogen removal and recovery technologies treating digested sludge dewatering reject water at municipal wastewater treatment plants. The results show that the environmental impact of physical-chemical nitrogen recovery is generally lower than that of biological removal, especially when accounting for the avoided impact due to the application of byproducts as fertilizer. Nevertheless, this study demonstrated that physical-chemical nitrogen recovery is only favorable for influent streams containing sufficient ammoniacal nitrogen and a slightly basic pH. Moreover, optimizing N2O emissions from partial nitrification/anammox could drastically reduce its environmental impact, making it competitive with physical-chemical nitrogen recovery from an environmental perspective. The findings of this study demonstrate that the implementation of side stream treatment for digested sludge reject water, whether via nitrogen recovery or optimized biological removal, results in substantial environmental benefits compared to conventional recirculation to the main wastewater treatment line. The comparative advantage between nitrogen recovery and removal technologies is not absolute; rather, it is contingent upon site-specific influent characteristics and the prevailing conditions of fertilizer production systems.
>	Navigating Global Challenges And Opportunities For Biosolids Management Through Adaptive Planning Frameworks
	Richard <u>Lancaster</u>, Atkinsréalis (United Kingdom)
	Biosolids management is an essential and growing challenge for the water sector. As biosolids production increases annually, inadequate management can result in significant environmental pollution—impacting air, land, and water—and can also drive up the carbon footprint and operational costs of wastewater treatment. The sector is under increasing pressure from global drivers, emerging contaminants, and heightened societal awareness, all of which are straining existing management routes. At the same time, the circular economy is gaining prominence, presenting both challenges and opportunities that will shape the future of wastewater, sewage sludge, and biosolids management. This work aims to support the water sector in understanding the diverse and evolving drivers affecting biosolids management within their unique contexts. The goal is to build confidence in decision-making and in the deployability of alternative strategies that can address these challenges and capitalise on new opportunities. The AtkinsRéalís adaptive planning approach has been developed and applied globally to help the water sector navigate a range of potential strategic deployment options for biosolids. This approach identifies possible strategies, technologies, markets, and commercial models, assessing their readiness and defining implementation pathways to expand available options and enhance investment confidence. A clear transformation roadmap is produced, detailing innovation, knowledge enhancements, regulatory requirements, and stakeholder engagement necessary for successful delivery. There is no universal solution; currently, only a few truly deployable alternatives exist—primarily recovery to agriculture, incineration, and, in some regions, landfill. Some emerging strategies, such as drying or carbonisation for alternative fuels, are also being explored. However, significant work remains to broaden the range of viable strategies, open new circular economy pathways, and sustain existing ones where appropriate.
>	Advancing Urban Water Reuse: Integrating Circularity, Resilience, And Stakeholder Engagement
	Beverley <u>Stinson</u>, AECOM (United States)
	Cities worldwide face escalating water stress due to climate variability, rapid population growth, and aging infrastructure. While water reuse offers a viable solution to enhance resilience, adoption has been constrained by fragmented planning, regulatory uncertainty, and limited stakeholder trust. This paper presents a comprehensive framework for advancing urban water reuse through the integration of circularity, resilience planning, and stakeholder engagement, grounded in Environmental, Social, and Governance (ESG) and Triple Bottom Line (TBL) principles. The approach combines technical and strategic planning to connect municipal and industrial reuse systems, optimize resource recovery, and strengthen water reliability under drought and growth pressures. The framework was developed using drought management and reuse planning methodologies, system-level resource recovery evaluation, and case studies from the U.S. Southwest. These case studies demonstrate how coordinated planning, transparent performance metrics, and stakeholder alignment can accelerate adoption and build long-term public confidence. Key insights highlight that integrating water, nutrient, and energy recovery creates operational efficiency, while embedding ESG and TBL evaluation ensures that social equity and environmental protection are balanced with financial feasibility. The framework provides utilities with practical pathways to evaluate trade-offs among cost, sustainability, and community value, enabling more transparent decision-making. This integrative model supports the transition to circular urban water systems, where reuse is embedded within the broader context of climate resilience and equity. By aligning technology, governance, and community engagement, municipalities can achieve sustainable reuse programs that enhance water security, reduce environmental impact, and foster public trust—positioning reuse not just as a technical solution but as a cornerstone of resilient urban infrastructure.

[TS6.6] STAKEHOLDER ENGAGEMENT 17 June 2026 (Wednesday) 4:00PM – 5:30PM Room 4	
Session Chairs: Lucy <u>Thomas</u> , RSK Group (United Kingdom)	
>	Innovation ecosystems as enablers of circular water strategies: insights from Mediterranean regional dynamics
Lucia <u>Gusmaroli</u>, Catalan Water Partnership (Spain)	
Circular water systems are increasingly recognised as essential to managing nutrients and addressing water scarcity and ecosystem degradation—pressing challenges across Mediterranean basins. Although technological innovations such as advanced treatment processes, nature-based solutions, precision agriculture, and digital monitoring have made significant progress, their deployment at scale remains uneven. Persistent issues such as fragmented governance, limited stakeholder coordination, and difficulties in scaling successful demonstrations continue to hinder the transition from isolated pilots to systemic circular practices. Innovation ecosystems play a decisive role in shaping these dynamics. Mediterranean regions host diverse constellations of research institutions, water utilities, agrifood producers, SMEs, public administrations, and civil society organisations whose interactions determine how circular solutions emerge, gain legitimacy, and reach operational maturity. Understanding how these ecosystems function, and where their systemic strengths and constraints lie, is therefore essential to accelerating circularity in water and nutrient management. This study draws on a comparative analysis of six regional innovation ecosystems located in Greece, Italy, and Spain, each facing distinct yet interconnected nutrient pollution pressures across the land–river–sea continuum. The objective is to explore how governance structures, technological capabilities, stakeholder configurations, and policy frameworks influence the ability of these territories to implement and scale circular water strategies. By examining shared strengths, recurring obstacles, and system-wide opportunities, the analysis highlights the potential of innovation ecosystems to serve as strategic levers for advancing circularity.	
>	Unlocking Circularity through Bold Integrated Management at WSSC Water
Priscilla <u>To</u>, WSSC Water (United States)	
WSSC Water serves 1.9 million residents across Maryland’s Washington, D.C. suburbs. With over a century of operations, the utility faces the common global challenges: aging infrastructure, climate volatility, emerging contaminants, regulatory pressures, rising costs, and limited land availability for development. To address these immense challenges, WSSC Water has reimagined its 1,800-person workforce and a six-year USD \$5 billion capital investment plan. The vision is to deliver affordability, water quality and service delivery through collaborative systems thinking, stakeholder engagement and innovation implementation, in order to build the trust and investment needed to achieve circularity. This approach is already delivering success around the issues of emerging contaminant mitigation, customer-oriented systems engineering, and energy-focused resource recovery, and it positions the utility to make continued progress as they face future challenges.	
>	Water as a Catalyst: A Nexus-Based Model for Tribal Empowerment in Rural India
Pramod <u>Gaikwad</u>, Social Networking Forum (India)	
In remote tribal regions of Maharashtra, India, lack of access to safe water perpetuates cycles of poverty, malnutrition, poor health, and low educational attainment. Women and children often walk several kilometers daily to fetch water, resulting in school dropouts, undernutrition, and health risks. Addressing water access in isolation has limited impact; solutions must recognize the water–food–health–education nexus. The Social Networking Forum (SNF), a grassroots NGO, has developed a replicable community-led model for holistic rural development. Beginning in 2010 as a social media movement, SNF mobilized youth, technical experts, and donors to co-create sustainable water solutions. The approach integrates: • Community participation and cost-sharing to ensure ownership. • Low-cost, context-specific water supply systems in hilly terrain. Complementary interventions in malnutrition eradication, school libraries, and rural health.	
>	Water Corporation Retention And Training In Wastewater Treatment
Kathryn <u>Heaton</u>, Water Corporation (Australia)	
Water Corporation manages over 240 treatment plants across Western Australia, including 112 wastewater facilities. With increasing complexity in treatment processes, digital transformation, aging infrastructure, and constrained funding, Water Corporation needs to retain skilled trained employees to manage through these challenges. A strategic uplift in wastewater treatment and process control training and retention initiatives commenced in 2021 for the major wastewater treatment plants in the Perth Metropolitan area, aiming to address technical skill gaps, improve operational performance, and enhance employee satisfaction. A Process Control Training Centre was established, successfully servicing staff Statewide, immediately creating efficiencies in fault rectification at treatment plants. Given the success of the wastewater treatment training in Perth, it is proposed to implement a similar wastewater treatment training model for regional wastewater treatment plants subject to funding being available.	

WATER CONVENTION

LIST OF POSTER PRESENTATIONS

THEME 1: WATER NETWORK

- > **A Novel Framework for Flood Hazard Classification to Enhance Urban Flood Resilience**
Kenneth Hunu, Atkinsrealis
- > **Advancing Proactive Asset Management at PUB: Predicting Pipeline Leaks with Machine Learning for Proactive and Targeted Renewal**
Jiajie Wong, PUB; Kah Cheong Lai, PUB; Nigel Lim, PUB
- > **Applying Human-Centred Design to Flood Resilience for Indigenous Communities**
Molly Quirke, GHD; Reiko Baugham, GHD
- > **Are mobile phone networks the underdog of smart metering?**
Thomas Allen, RSK Group Plc
- > **Customer perspectives on smart water use sensors and data feedback in domestic settings**
Heather Smith, Cranfield University; Harry Nicklin, Cranfield University; Paul Jeffrey, Cranfield University
- > **Deployment of Acoustic Monitoring on Transmission Main Network Using a Data-as-a-Service Model**
Mohamad Iznul Muazim, Mueller Water Products; Harry Low, PUB
- > **Distribution and diversity of benthic macroinvertebrates along the Mthatha River, Eastern Cape, South Africa: implications for water quality biomonitoring**
Selunathi Sakwe, Department Of Water And Sanitation
- > **Effective Ammonia Based Aeration Control Using On-Line Process Colorimetry with an Innovative Disposable Filter**
Melody White, In-Situ
- > **Ensemble Learning for Water Pipeline Leak Detection Using Acoustic Sensing: Integrating Deep Feature Learning and Frequency-Based Peak Tracking**
Kate Duhig, LWF Group Inc.; Mustafa ALHAMDI, LWF Group Inc.; Gareth Lees, LWF Group Inc.; Igor Kolesnikov, LWF Group Inc.
- > **Evaluation on the Effect of Ecological Control System of Non-point Source Pollution in Typical Small Watershed of Danjiangkou Reservoir Area**
Wang Chao, Changjiang Water Resources Commission of the Ministry of Water Resources
- > **Flow estimation in Water Pipelines using Acoustic Sensing**
Mustafa ALHAMDI, LWF Group Inc.; Gareth Lees, LWF Group Inc.; Igor Kolesnikov, LWF Group Inc.
- > **From data sludge to liquid gold: Transforming the future of water infrastructure through digital twins**
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Alexus Van der Weyden, Frontier Economics
- > **Supporting Climate Resilience of Infrastructure and Communities through implementing Nature-based Solutions in the Pacific Islands**
Eleanor Earl, Arup; Ed Rowe, Arup; Matthew Johnston, Live and Learn Environmental Education
- > **Short-Pulse Oxygen Nanobubble Aeration Elevates Supersaturated Dissolved Oxygen, Controls Total Ammonia Nitrogen, and Cuts Energy in High-Density Nile Tilapia Production**
Amit Kapur, NICO Nanobubble India Pvt Ltd; Aman Kapur, NICO Nanobubble India Pvt Ltd; Anant Kapur, NICO Nanobubble India Pvt Ltd
- > **Virus Removal (indicators) by Nature-based Water Treatment**
Gertjan Medema, KWR Water Research Institute; Bas van der Zaan, KWR Water Research Institute
- > **Wastewater as a Sentinel: Mapping the Landscape of Antimicrobial Resistance Genes in Singapore**
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- > **An Innovative Implementation Model to Identify SDG Goal Interlinkages whilst Maximizing Stakeholder Engagement towards Achieving the 2030 Goals**
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- > **Brine as a source for decarbonization together with sustainable carbonates production**
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- > **Determining the carbon footprint of biogas production and use**
William Barber, Cambi Inc.
- > **Enabling circular economy through resource recovery from wastewater**
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- > **Water as a Battery**
John Ferguson, Danfoss; Georg Herborg, Danfoss; Francisco Jiminez-Castellanos, Danfoss
- > **Water, Energy, and Environment Circularity**
Mohammad Alizadehfard, Osmosis Technology & Engineering Company (OSMOTEC)

REGISTRATION & ENQUIRY

REGISTRATION

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To encourage broad and inclusive participation at SIWW2026, a range of pass types and fee structures are offered. This includes lower registration fees for delegates from upper-middle, lower-middle, and low-income countries (as classified by the World Bank), as well as for students.

- Promo codes will be emailed to eligible reviewers, workshop organisers, oral, poster presenters for registration of Delegate Full Pass. Presenters are required to register for the Delegate Full Pass.
- Student discount is applicable to students currently studying in an Institute of Higher Learning. Students are required to email the organiser at registration@siww.com.sg with a copy of their student matriculation card or ID to obtain a student promo code before they proceed to register.

CONTACT INFORMATION

For any enquiries, please contact the Water Convention Secretariat at: waterconvention@siww.com.sg.

Detailed information of the Water Convention is also available here at <https://www.siww.com.sg/home/programme/water-convention>.

ABOUT THE CO-ORGANISERS



International Water Association (IWA)

The International Water Association is the organisation that brings together science and practice of water management in order to reach a world in which water is wisely managed to satisfy the needs of human activities and ecosystems in an equitable and sustainable way.

The IWA is a global knowledge hub and international network for water professionals and anyone concerned about the future of water. We bring together know-how and expertise to instigate ground-breaking solutions.



PUB, Singapore's National Water Agency

PUB is a statutory board under the Ministry of Sustainability and the Environment (MSE). It is the national water agency, which manages Singapore's water supply, water catchment, and used water in an integrated way. From April 2020, PUB also took on the responsibility of protecting Singapore's coastline from sea-level rise as the national coastal protection agency.

PUB has ensured a diversified and sustainable supply of water for Singapore with the Four National Taps (local catchment water, imported water, NEWater, desalinated water). PUB leads and coordinates whole-of-government efforts to protect Singapore from the threat of rising seas and the holistic management of inland and coastal flood risks.

PUB calls on everyone to play a part in conserving water, in keeping our waterways clean, and in caring for Singapore's precious water resources. If we all do our little bit, there will be enough water for all our needs – for commerce and industry, for living, for life.

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As one of the premier global platforms, the biennial Singapore International Water Week (SIWW) gathers thought leaders, experts and practitioners from governments, cities, utilities, and industry to share knowledge and best practices on innovative water, coastal and flood solutions, and foster partnerships to tackle urban water and associated climate challenges.

Organised by Singapore International Water Week Pte Ltd, a subsidiary of PUB, Singapore’s National Water Agency, the 11th edition of SIWW will be held from 15 to 18 June 2026 at the Sands Expo and Convention Centre in Singapore.

For enquiries on Water Convention, please contact:
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