Singapore International Water Week

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 25 May 2026

Water Convention is jointly organised by

IWA the international water association

PUB SINGAPORE'S NATIONAL WATER AGENCY

TABLE OF
CONTENTS

SIWW2026

PROGRAMME OVERVIEW

Key Pillars: • Municipal Water Solutions | • Coastal & Flood Resilience | • Industrial Water Solutions

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

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

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

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

Enrique Cabrera
Professor of Fluid Mechanics
Universitat Politècnica de València

Kah Cheong Lai
Senior Deputy Director
PUB, Singapore's National Water Agency

Martine Watson
Chief Digital and Information Officer
Urban Utilities

Tertius Rust
Founder and Executive Director
The Innovation Consulting Company

Zdravka Do Quang
Group Innovation Programs Officer
SUEZ

THEME 2: WATER TREATMENT

THEME LEADER

Jonathan Clement
Director, Global Advanced Water Solutions
Ramboll

MEMBERS

Bob Stear
Chief Engineer
Severn Trent

Key Wee Ong
Chief Specialist, Potable Water Treatment
PUB, Singapore's National Water Agency

Michael Storey
Director of Innovation
SUEZ Australia & New Zealand

Nikolay Voutchkov
Founder and the Director General
Water Globe Consultants

Min Yang
Deputy Director
Research Center for Eco-Environmental Sciences

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

Govind Alagappan
President
Gradiant

Guihe Tao
Chief Specialist, Used Water Treatment
PUB, Singapore's National Water Agency

Jay Bhagwan
Executive Manager, Water Use and Waste Management
Water Research Commission

Mads Leth
Chief Executive Officer
VCS Denmark

Mark van Loosdrecht
Professor
Delft University of Technology

Norhayati binti Abdullah
Associate Professor
Tokyo City University

Susan Moisio
Senior Vice President and Global Water Market Director
Jacobs

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-Kassinos
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

THEMES

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.

THEME 4 — CLIMATE RESILIENT CITIES, FLOOD MANAGEMENT AND COASTAL PROTECTION

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.

THEME 5 — WATER QUALITY AND ONE HEALTH

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.

THEME 6 — NEXUS & RESOURCE CIRCULARITY

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.

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_2O) 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 **WS5.6** Tackling Health and Climate Resilience with WASH	**TS6.4** Policy & Planning for Circularity
	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	**TS6.5** Circularity Frameworks
	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 Centre 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
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		**WS5.8** 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	**WS6.5** Data Centers: Strategies And Opportunities For The Water Sector
	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 – 12:15PM	**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)
12:15PM – 12:30PM	**Keynote 2**: **Digital Water: AI, Autonomy, and Why Humans Still Matter?** **Prof Dragan Savic** Global Advisor Digital Sciences, KWR Water Research Institute (Netherlands)
12:30PM – 12:45PM	**Keynote 3: Transformation of the Water Industry in Malaysia** **YBhg. Dato' Seri Ir. Jaseni Maidinsa** Chairman, Pengurusan Aset Air Berhad (Malaysia)
12:40PM – 12:55PM	**SIWW2026 Water Convention – Trends and Analysis of Abstracts** **Loveji 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.

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_2O) 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			**[WS5.7]**^ Wastewater and Environmental Surveillance for New Pathogens
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	**[WS6.5]** Data Centers: Strategies And Opportunities For The Water Sector	

Session ends 12.45pm
^ Session ends 6pm

THEME 1 : WATER NETWORK

[WS1.1] ADAPTING SOUTH ASIA'S WATER SYSTEMS IN A DIGITAL AGE

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 – 11:20AM	**Keynote**
	• Shri Parvesh Sahib Singh - Honourable Minister, Government of Delhi, India
11:20AM – 12:05PM	**Turning Smart Metering and Leak Detection into Everyday Operations**
	Moderator: V. Srinivas Chary - CEO, WASH Innovation Hub, India • Dalbir Singh - Chief Engineer, Delhi Jal Board, India • Gokul Krishna Govindu - Founder, SmartTerra) • Thiagaraja Vinayagam - Technical Director, Pinnacle Infosys Pte Ltd
12:05PM – 12:30PM	**From Ambition to Action – What Does Real Digital Transformation Look Like on the Ground?**
	Moderator: Frederick Royan - SWAN Forum & Associate Partner, Frost & Sullivan • Amit Vaidya - Director Growth Market, Xylem Vue • Amritanshu Kumar - Market Development Director Asia, Water, Bentley (TBC) • Anil Sethi - Chairman, Pump Academy (TBC)
12:30PM – 2:00PM	**Networking Lunch**
2:00PM – 2:05PM	**SWAN India Update**
	• Raveena Shinde - India Manager, SWAN Forum, India
2:05PM – 2:20PM	**Keynote**
	• Shri Vijay Kumar Bidhuri - Chief Executive Officer, Delhi Jal Board (TBC)
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 Mohd Soeb Iftekhar - Director of Programs, International Development Enterprise (iDE) Bangladesh, Bangladesh Md. Ashraful Alom - Technical Specialist, International Development Enterprise (iDE) Bangladesh, Bangladesh
3:20PM – 3:30PM	**Closing Remarks**

[WS1.2] SWAN APAC WORKSHOP: TRANSFORMING DIGITAL WATER FOR SHARED PROGRESS

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

AUTODESK

Programme

9:00AM – 9:10AM	**Welcome and Introduction**
	• Dr. Amir Cahn - CEO, SWAN Forum, UK
9:10AM – 9:30AM	**Keynote on Climate Resilience and Adaptation**
	• 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, UK
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 • Doeke Schippers - Director of Water Production and Distribution, Vitens, Netherlands
11:40AM – 12:30PM	**SWAN 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. • 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 – The Practical "How to"**
	1. **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
	2. **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
	3. **Financing the Digital Transition at Scale: How can utilities design delivery and financing models that scale smart water initiatives?**
	Led by Alexus Van der Weyden – Economist & Director, Frontier Economics, Australia Olivier Pison – Head of Digital Solutions Asia, SUEZ, Singapore
	4. **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
	5. **NRW's Prevention Over Reaction: How can utilities turn loss into data-driven value?**

	Led by Mark Nicol - Commercial Director, HWM Global, Singapore and Puranut Wisutjindaporn (Pong) - Business Development Manager, Water Industry, Yokogawa, Singapore
	6. **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
	7. **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 Led by Jason Lancelot - Senior Manager, InEight, Australia
3:30PM – 5:00PM	**Networking Reception**

THEME 2 : WATER TREATMENT

[WS2.1] CERAMIC MEMBRANES FOR PRE-TREATMENT OF SEAWATER DESALINATION

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
2:15PM – 2:30PM	**PUB’s experience with Desalination Pretreatment**
	• Daniel Teo - General Manager Tuas Desalination Plant, PUB, Singapore's National Water Agency, Singapore
2:30PM – 2:45PM	**Saudi Water Authority’s experience with desalination pretreatment**
	• Eng Tarik Al Ghaffari - Vice President for Research & Promising Technologies, Saudi Water Authority, Saudi Arabia (TBC)
2:45PM – 3:00PM	**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
3:00PM – 3:30PM	**Panel Discussion lead by Prof Hu Jiangyong**
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

[WS2.2] OVERCOMING THE SOCIAL, TECHNICAL AND INSTITUTIONAL BARRIERS TO DIRECT POTABLE REUSE

17 June 2026 (Wednesday) | 9:00AM - 12:30PM | Room 6

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	**NEW WATER Treatment Plant Manila, Philippines**
	• TBC
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 Afria
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: Logal Government Perspectives On Community Readiness For Potable Reuse**
	• Linda Holm - Mörbylånga Self-Adapting Water Reuse Plant, Öland, 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

[WS2.3] INCORPORATING NATURE BASED WATER TREATMENT SOLUTIONS

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
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	**Modeling 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 wastewtaer**
	• 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

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

[WS3.1] SUSTAINABLE GLOBAL BIOSOLIDS MANAGEMENT STRATEGIES

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**
	• Richard Lancaster - Global Bioresources Director, AtkinsRealis, United Kingdom
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 strategy**

	• Rex Liu - Director Infrastructure, AtkinsRéalis, Hong Kong
10:30AM – 11:00AM	**Networking Break**
11:00AM – 11:45AM	**Panel Q&A Interactive Session**
11:45AM – 12:20PM	**Roundtable Discussion**
11:45AM – 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

THEME 4: CLIMATE RESILIENT CITIES, FLOOD MANAGEMENT AND COASTAL PROTECTION

[WS4.1] ECONOMICS FOR CLIMATE-RESILIENT WATER INVESTMENTS

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 – 11:10AM	**Welcome Remarks**
	• Christian Nyerup - Global Service Line Director for Climate Adaptation, Ramboll, Netherlands
11:10AM – 11:30AM	**Economics for Climate Resilient Water Investments**
	• Alexus Van der Weyden – Economist & Director, Frontier Economics, Australia
11:30AM – 11:45AM	**International Case Study**
11:45AM – 11:55AM	**SEA Case Study**
11:55AM – 12:20PM	**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.
12:20PM – 12:30PM	**Closing Remarks**
	• Christian Nyerup - Global Service Line Director for Climate Adaptation, Ramboll, Netherlands

[WS4.2] ADAPTATION PATHWAY BUILDING SESSION RESPONDING TO FLUVIAL FLOOD RISK IN SOUTHEAST ASIA

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 – 4:20PM	**Introduction & Scene Setting**
	• Nina Noreika - Senior water Consultant, Arup, United Kingdom
	• Serena Ashdown – Civil Engineer, Arup, United Kingdom
4:20PM – 4:50PM	**Sequencing of portfolios into high-level pathways**
	• Nina Noreika - Senior water Consultant, Arup, United Kingdom
4:50PM – 5:15PM	**Group Discussion**
	• Serena Ashdown – Civil Engineer, Arup, United Kingdom
5:15PM – 5:30PM	**Presentation**
	• Nina Noreika - Senior water Consultant, Arup, United Kingdom

[WS4.3] INTEGRATED FLOOD RESILIENCE FOR HIGH-DENSITY COASTAL CITIES

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 (Works) 2, Development Bureau,, Hong Kong SAR China

[WS4.4] NATURE BASED SOLUTIONS FOR RESILIENT WATER SYSTEMS IN ASIA PACIFIC – MAXIMIZING INFRASTRUCTURE INVESTMENT VALUE

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.

THEME 5 : WATER QUALITY AND ONE HEALTH

[WS5.1] RETHINKING WATER AND HEALTH: INTEGRATING ONE WATER AND ONE HEALTH

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**
	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. Designing a One Water-One Health strategy for a growing urban-agricultural region
	• Dr Siao Yun Chang - Micro-Biological Lab 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 Marion Savill – Executive Director, Affordable Water, New Zealand
	• 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 – 3:00PM	**Interactive Q&A and Panel session**
3:00PM – 3:10PM	**Overview genome/DNA-based (bio)sensors for microbial contaminants**
	• Prof Masaaki Kitajima – Professor, University of Tokyo, Japan
3:10PM – 3:20PM	**Overview chip-based electronic/fotonic (bio)sensors for chemical pollutants**
	• Dr Raghav Narayan - CEO, Aprisium (TBC)
3:20PM – 3:30PM	**Overview of Issues for Biosensors in Regulatory/Policy Area**
	• Dr David Cunliffe – Principal Water Quality Adviser, SA Health, Australia
3:30PM – 4:00PM	**Networking Break**
4:00PM – 4:05PM	**Breakout Group Explanation**
	• Dr Marion Savill – Executive Director, Affordable Water, New Zealand

	• Dr Robert Bos – Independent Consultant, Switzerland
4:05PM – 4:45PM	**Breakout Discussion**
	• Microbiology: Moderated by 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	**Breakout Discussion**
4:50PM – 5:25PM	**Interactive Q&A and Panel discussion**
5:25PM – 5:30PM	**Final Discussion**

[WS5.3] PRACTICAL LESSONS LEARNED FROM PEER-TO-PEER WATER CYCLE PARTNERSHIPS, AROUND THE WORLD (LAO PDR, JORDAN, KENYA)

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 partnership 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.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 – 4:30PM	**Interactive Presentations – Water Cycle Partnerships**
	• Henk Ovink - Executive Director, Global Commission on the Economics of Water, Netherlands
	• Mick Morada - Project leader, WaterWorX, World Waternet, Laos
	• Frodo van Oostveen – Chief Executive Officer, World Waternet, Laos
4:30PM – 5:00PM	**Roundtable Deep Dive**
5:00PM – 5:30PM	**Collective Water Cycle Roadmap**

[WS5.4] SAFEGUARDING SURFACE WATERS: TACKLING HARMFUL ALGAL BLOOMS AND TASTE & ODOUR CHALLENGES

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

Synopsis

Details TBC

Programme

Details TBC

[WS5.5] OUR NEXT 10 YEARS' INTEGRATED FRAMEWORK FOR MICRO- AND NANO PLASTIC SURVEILLANCE AND HEALTH RELEVANT ASSESSMENT

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:

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**
	• 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

[WS5.6] TACKLING HEALTH AND CLIMATE RESILIENCE WITH WASH

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
	• Maria Tran – Engineer, Asian Development Bank, Philippines
	Case study Papua New Guinea Utilities Perspective
	• James Young – Chief Executive Officer, 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**
	A. Implications for future investments in WASH, drainage, waste management
	B. Alternative approaches to reduce future health risks of climate change
	C. Opportunities for cross-sector collaboration
	D. Potential health benefits as argument for the mobilisation of climate funds for WASH
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 – Engineer, Asian Development Bank, Philippines
	Cross sectoral collaboration in Practice
	• Speaker TBC
	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 Dicussion 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

[WS5.7] WASTEWATER AND ENVIRONMENTAL SURVEILLANCE FOR NEW PATHOGENS

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: 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**
	• 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**
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

[WS5.8] INVESTING IN CLIMATE RESILIENT SANITATION: COSTS, FINANCE AND PRIORITIES FOR ACTION

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**
	• Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
11:10AM – 11:15AM	**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.
	• Speaker TBC
11:15AM – 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
	• Speaker TBC
11:30AM – 12:00PM	**Panel discussion: Navigating the complexity of financing climate-resilient sanitation**
	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.
	• Moderated by Naomi Carrard - Associate Professor & Research Director, Institute for Sustainable Futures, University of Technology Sydney, Australia
	• Panelists: TBC
12:00PM – 12:25PM	**Interactive small-group discussions**
	Exploring context-specific financing models and strengthening the climate rationale for sanitation investments
12:00PM – 12:30PM	**Wrap up and Close**
	Actionable insights for addressing finance challenges and supporting climate-resilient sanitation systems

THEME 6 : NEXUS & RESOURCE CIRCULARITY

[WS6.1] ADVANCING NITROUS OXIDE (N_2O) MONITORING: GLOBAL PROTOCOLS, COLLABORATION, AND PATHWAYS TO SECTOR-WIDE ACTION

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 N_2O 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 N_2O Monitoring – to be facilitated by 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 N2O Protocol Development & Content**
	• Prof Liu Ye – Professor, The University of Queensland (UQ), Australia
9:25AM – 9:55AM	**Global Global Case Studies Presentations (10 mins each)**
	Each utility will share their full scale N2O monitoring Design and set-up
	• 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**
	Facilitated by 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 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
	• Gurdev Singh - Chief Engineering and Technology Officer, PUB Singapore's National Water Agency, Singapore
	• Dr Bob Stear - Chief Engineer, Severn Trent Plc, UK
	• 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

[WS6.2] NET ZERO FOR WATER UTILITIES: HAS MOMENTUM STALLED – AND HOW DO WE ACCELERATE?

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**
	• Sander Mage - Executive Board, AGV and Dutch Association of Water Authorities, Netherlands
	• David Bergmann – CEO, Water Research Australia, Australia
4:55PM – 5:20PM	**Moderated Dialogue**
5:20PM – 5:30PM	**Conclusion and Wrap Up by Moderator**

[WS6.3] EXPANDING CIRCULARITY AND NEXUS IN WATER: WHAT ARE THE LEVERAGE POINTS FOR SYSTEMS CHANGE?

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

[WS6.4] CROSS SECTOR COLLABORATION TO ACCELERATE THE CIRCULAR WATER ECONOMY

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, Water Environment Federation (WEF), United States
	• Co-Chair 1: Laila Sukkariyyah, Water Environment Federation (WEF), United States
	• Co-Chair 2: Jiangyong Hu, Environmental Engineering Society of Singapore (EESS), Singapore
11:10AM – 11:40AM	**Circular Water Economy 101 Intro and Fireside Chat Panel Discussion**
	• Jiangyong Hu, Environmental Engineering Society of Singapore (EESS), Singapore
	• Sungpyo Kim – Korea University, Korea
	• Lucia Gusmaroli – Catalan Water Partnership (CWP), Europe
	• Keith Hobson, Water Environment Federation (WEF), United States
	• Junhong Shan, PUB Singapore's National Water Agency, Singapore
	• Wenlong Wang, Tsinghua Univsersity, China
	• Daisuke Sano – Professor, Tohoku University, Japan
11:40AM – 12:20PM **12:20PM – 12:30PM**	**Interactive Design Sprint** **Concluding Fireside Chat Panelists Remarks/Observations**
	• Laila Sukkariyyah, Water Environment Federation (WEF), United States

[WS6.5] DATA CENTERS: STRATEGIES AND OPPORTUNITIES FOR THE WATER SECTOR

18 June 2026 (Thursday) | 2:00PM - 3:30PM | Room 7

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 scare 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

2:00PM – 2:10PM	**Welcome Remarks**
	• Vikram Kumar - Regional Industry Director, Infrastructure, Asia Pacific, International Finance Corporation, World Bank Group
2:10PM – 2:25PM	**Technology Evolution and Water Demand for Data Centers**
	• Speaker TBC
2:25PM – 3:10PM	**Moderated Panel Discussion**
	Moderated by Victoria Delmon – Manager, Upstream and Advisory, Infrastructure, Asia Pacific, I International Finance Corporation, World Bank Group
3:10PM – 3:30PM	**Q&A with Audience**

TECHNICAL SESSIONS

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 Do Quang, SUEZ (France)

> **The New Way to Detect Network Leaks At Scale**

***David Mason,* South East Water (Australia)**

While utilities across the world transition to digital metering to improve water management, many programs are focused on customer side leaks and do not include technology to detect network-side leaks. South East Water (Australian water utility in Melbourne's south-east) has developed an innovative solution to detect and locate network-side leaks through a miniature vibration sensor integrated into new smart meters. Through these sensors, over 700 network leaks have been identified and repaired, saving over 740 megalitres of non-revenue water since February 2024. Upon development, the technology was projected to deliver a significant contribution to the overall net present value of the utility's mass digital metering program; its inclusion in the business case made the digital metering program financially viable. External consultants estimated that once fully deployed (660,000 vibration sensors), 1.6GL of water per year would be saved (1% of the current non-revenue bulk water South East Water purchases). The results to date are tracking beyond initial estimations.

> **Still Leaking After All These Years: Insights from Two Decades of Water Transmission Pipeline Inspection**

***Eric Toffin,* 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 Bonardet,* 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 Pentaliotis,* 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.

[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:
Kai Cheong Lai, PUB, Singapore's National Water Agency (Singapore)

> Advancing Network Intelligence Scalable Smart Water Analytics with Predictive and Diagnostic Capabilities

Olivier Pison, **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

Sunil Sharma, **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

Aldred Er Guo Yao**, 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 Chair:
Liyan Li, National University of Singapore (Singapore)

> A Rapid And Low-Cost Colorimetric Dip-Strip Kit For Real-Time Microbial Monitoring

***Jyoti Gautam*, 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., Escherichia coli) within 5 minutes at room temperature (25 ºC). 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.

> Online Flow Cytometry for Assessing Microbial Water Quality in Verbier's Distribution Network

***Peter Desmond*, Hamad Bin Khalifa University (HBKU) (Qatar)**

Drinking water networks maintain a disinfectant residual by dosing chlorine that decays along the network to preserve microbial water quality at the tap. However, chlorine can create excessively oxidative conditions at the pipe surface, accelerating material degradation. HDPE is widely used due to its cost-effectiveness and corrosion resistance; however, it may leach organics and oxidize under chlorination. This study aimed to (i) quantify organic carbon release and biofilm potential and (ii) monitor HDPE degradation in potable water. Batch assays (25 °C, 7 days) quantified total organic carbon (TOC) released from HDPE coupons in tap water with ~0.02 mg/L free chlorine, with a parallel test extending to 1 mg/L. Material aging was monitored via weekly FTIR analysis over 10 weeks and compared with in-service HDPE pipes (≤6 years). TOC remained low (<0.35 mg/L) and comparable to water-only controls, indicating limited carbon migration at 0.02 mg/L. Batch FTIR showed progressive emergence of a ~1700 cm^{-1} carbonyl band; an anhydride-type –CO–O–CO– signature appeared earlier and more clearly under 1 mg/L exposure, evidencing dose-dependent oxidation. In contrast, field pipes exhibited pronounced carbonyl features, consistent with oxidation-driven aging. An amide band near ~1650 cm^{-1}—especially notable in the service pipes—suggests potential biofilm, despite the low measured TOC. Forthcoming tests at 1 mg/L will clarify impacts on migration, biofilm growth, and service life.

> Disinfection-Driven Oxidation of Polymer Pipes and The Effects on Distributed Water Quality

***Mohammad Tariq*, 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

***Ngoc Minh Nguyen*, 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:
Tertius Rust, The Innovation Consulting Company (South Africa)

> Measuring and Strengthening Innovation Team Climates with the Explorer Index®

***Annesley Crisp*, 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

***Beta Hakim*, 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

***F. Javier Fernandez*, 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

***Morgan Padayachee*, 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:
Albert Cho, Xylem Inc. (USA)

> 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 Sinske, **GLS Consultaing (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 Shaw**, 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.

> Digital Twins for Real-Time Operational Insights in Water Networks

Kelvin Siew**, Pengurusan Air Selangor (Malaysia)**

Air Selangor operates one of Southeast Asia's largest water distribution networks, supplying 5,000 MLD through more than 31,000 km of pipelines. Increasing demand, climate pressures, and ageing assets require utilities to adopt predictive and data-driven operational methods. This study presents Air Selangor's Digital Twin initiative, which integrates real-time SCADA, telemetry, GIS assets, and continuously calibrated hydraulic models to create a dynamic virtual representation of the distribution system. The Digital Twin enables real-time monitoring, scenario simulation, anomaly detection, and network optimization. Early implementation demonstrates improved decision-making speed, enhanced operational visibility, and better coordination across departments. The study outlines the architecture, modelling approach, and operational applications supporting Air Selangor's goal of full Digital Twin coverage and 90% model accuracy by 2029.

> 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 Chew**, 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:
Martine Watson, Urban Utilities (Australia)

> Water Accelerator Testbeds: Demonstrating the Next Generation of Innovative Technology

***Max Herzog*, 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

***Christine Boyle*, 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?

***Dragan Savic*, 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 Allen*, 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)

> **Presentation Title TBC**

Eric Hoek, **University of California, Los Angeles (United States)**

> **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 lmh 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 lmh/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:
Nikolay Voutchkov, Water Globe Consultants (Saudi Arabia)
Wee Joon Teo, National University of Singapore (Singapore)

> Turning Brine into Value: An open testbed for innovation and barrier removal

***Angel Rivero Falcon*, Instituto Tecnológico de Canarias (Spain)**

> Maven Brine Mining Plant – World 1st Commercial OARO Project: HPP & ERD On-Site Performance Results

***Francisco Jimenez Castellanos Lucena*, 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.

> A Comparative Study of Membrane and Thermal Techniques in Sea Water Brine Valorization

***Noura Chehab*, NEOM Company (Saudi Arabia)**

As global water scarcity continues to grow, desalination has become an indispensable solution for freshwater production. However, traditional desalination methods generate large volumes of concentrated brine, typically discharged into the environment, causing ecological concerns. To address this challenge, the focus has shifted toward brine valorisation—recovering valuable minerals while minimizing waste through innovative technologies.

This study highlights the advancements in next-generation membrane-based crystallization, offering a sustainable and energy-efficient alternative to traditional thermal crystallization. Membrane-based crystallization operates at an energy consumption of approximately 7-8 kWh/m³, a stark contrast to the 70-80 kWh/m³ required by thermal crystallization. Furthermore, the innovative use of smooth cellulose acetate membranes not only prevents fouling but also enables the production of high-purity crystals with 99.6% purity, setting a benchmark for efficiency and quality.

By leveraging these advancements, membrane-based crystallization provides a transformative approach to brine management, aligning with the goals of zero liquid discharge and sustainable mineral recovery. This presentation compares the energy efficiency, product quality, and environmental impact of membrane-based crystallization versus thermal crystallization, demonstrating the potential of membrane technologies to revolutionize desalination and resource recovery.

[TS2.3] TREATMENT FOR MICROPOLLUANTS

18 June 2026 (Thursday) | 9:00AM – 10:30AM | Room 2

Session Chair:
Shane Snyder, Georgia Institute of Technology (United States)
Wee Joon Teo, National University of Singapore (Singapore)

> Hybrid Ceramic Membranes – An alternative for the Removal of Micropollutants

***Christian Goebbert*, 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 Hossen*, 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 Hubner*, 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 Ong, PUB Singapore's National Water Agency (Singapore)
Enyu Liu, National University of Singapore (Singapore)

> Beyond Energy Efficiency: The Broader Advantages of Semi-Closed Reverse Osmosis (SCRO) Desalination

***Qianhong She*, 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 Ho*, 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 Delahaye*, 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 Lucena,* 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:
Enyu Liu, National University of Singapore (Singapore)

> RO Hidden Features: What You Can Achieve that Others Don't

***Val Frenkel*, 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

***Masaru Horiuchi*, 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

***Keith Andes*, 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

***Wanting Wang*, 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 Bhagwan, WRC (South Africa)

> Algal-Based Wastewater Treatment: Balancing Nutrient Removal, Biomass Productivity, Resource Recovery, and Pathogen Removal

***Harizah Hariz*, 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.

> Effectiveness of Constructed Vertical Helophyte Filter System (VHFS) for Wastewater Treatment in Various Industries

***Anthony Sales*, Department of Science and Technology XI (Philippines)**

The volume of wastewater generated in the Philippines has increased by 32% over the last five years with 85% still untreated. Herein, the Department of Science and Technology Region XI (DOST XI) developed the Vertical Helophyte Filter System (VHFS) — a low-cost, nature-based wastewater solution that uses helophytes (bugang) to purify wastewater. The system uses anaerobic treatment followed by filtration through layered filter media. Pollutant indicators (pH, BOD5, TSS, Ammoniacal Nitrogen, Phosphate, Oil and Grease) were analyzed for influent and effluent samples. After treatment, pollutant indicators were reduced by an average of 13%, 95%, 92%, 82%, and 65% across project sites. Statistical analysis ($F = 22.82 > F\ crit = 3.06$, $p \leq 0.05$), confirmed significant treatment performances. Findings demonstrate that VHFS significantly reduced pollutant wastewater levels, offering an effective wastewater treatment solution. The project advances SDG 6 and SDG 14 by providing a scalable nature-based technology for wastewater treatment.

> Microalgae-Driven Optimization of Electron Donor Utilization and Electron Transfer and Distribution Accelerates Nitrate Removal in Cocultured Paracoccus Denitrificans

***Yue Li*, 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:
Orlando Garcia Rodriguez, National University of Singapore (Singapore)

> Transforming Toxic Chlorophenols into Carbon Source via Catalytic Hydrogenation for Enhanced Denitrification

***Zhenao Gu*, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences (China)**

The treatment of highly toxic chlorophenol wastewater remains one of the major challenges in industrial effluent management. In this study, we developed a catalytic hydrogenation strategy that rapidly converts chlorophenol contaminants into non-toxic cyclohexanol within 10 minutes. The resulting cyclohexanol can be utilized as an alternative carbon source to enhance microbial community structures in biological denitrification systems. Furthermore, when integrated with separation processes, cyclohexanol can be efficiently enriched, thereby generating substantial economic value. This work presents a novel and practical approach for both the efficient detoxification of chlorophenol wastewater and the simultaneous recovery of valuable resources.

> Harnessing the power of water and energy to help decarbonize a chemical and petrochemical site

***Federico Rizzo*, 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 Vlasschaert*, 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 $CaCO_3$ 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 significanlty reducing $CaCO_3$ 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 Hua*, 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:
Kartik Chandran, Columbia University (United States)

> Decarbonizing wastewater treatment and sanitation through integration of sewered and non-sewered treatment technologies

***Liron Friedman*, 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 (CH_4) 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

***Emma Ruqiao Shen*, 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 (N_2O) 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 N_2O emissions.

> Exploring Nitrous Oxide Dynamics in Biological Wastewater Treatment Systems through Machine Learning Insights

Kartik Chandran, 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

***Zhenju Sun*, Nanyang Technological University (Singapore)**

Between March and August 2025, plant-wide N_2O 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 N_2O-N kg to total N load (kg)) computed per the IPCC methodology. Train C (MBR) showed uniformly low liquid-phase N_2O (<0.06 mg L^{-1}) and a low N_2O 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 N_2O 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:
Speaker TBC

> Elephants, Horses, and Hares: Incorporating Flexibility for Futureproofing Water Resource Recovery Facilities

***Tim Constantine*, 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

***Mathieu Delahaye*, 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

***Han Zhuang*, 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

***Sock Hoon Koh*, 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 Sanmuganathan, PUB, Singapore's National Water Agency (Singapore)

> Presentation title TBC

***Susan Moisio*, Jacobs (United States)**

> Risk assessment of the sewer network to eliminate social and environmental damage

***Klara Ramm*, 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 Zhang*, 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 Lau*, 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:
Govind Alagappan, Gradient (Singapore)

> Systems Thinking for Addressing Data Centre's Water Needs

***Eveline Ekklesia*, 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 Morgan*, 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 Damak*, 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.

[TS3.8] ADVANCEMENTS IN NUTRIENT REMOVAL
17 June 2026 (Wednesday) | 4:00PM – 5:30PM | Room 3

Session Chairs:
Mark van Loosdrecht, Delft University of Technology (Netherlands)

> Adapting to changes in Incoming Influent from Design to Testing and Commissioning

***Anne Marie Li Wen Ang*, 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

***Amber Bullen*, 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 AtkinsRéalis 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

***Kartik Chandran*, 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:
Norhayati Abdullah, Tokyo City University (Japan)
Orlando Garcia Rodriguez, National University of Singapore (Singapore)

> Overcoming Challenges in Treated Sewage Effluent Reuse: What's Done and What's Next- Middle East

***Duraisaminathan Visvanathan*, 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 Pung*, 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 Delahaye*, 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 adsoprtion 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 Brion*, 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.

[TS3.10] ADVANCEMENTS IN THEREMAL TREATMENT OF BIOSOLIDS

18 June 2026 (Thursday) | 9:00AM – 10:30AM | Room 3

Session Chairs:
Colin Newbery, Jacobs International Consultants (Singapore)

> Alternative strategies for Biosolids - Advanced Thermal Conversion

***Stephen Riches*, 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

***Haoyang Li*, 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 Rus Perez*, 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 Barber*, 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

[] ADVANCEMENTS IN BIOSOLIDS MANAGEMENT

18 June 2026 (Thursday) | 11:00AM – 12:30PM | Room 3

Session Chairs:
Sock Hoon Koh, Black & Veatch (Australia)

> Volatile Solids Reduction, decoded: machine learning predicts digestion performance and its ripple effects across wastewater operations

***Mathieu Haddad*, 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

***Sofiane Mazeghrane*, 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

***Yit Guan Chew*, 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 sievings 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 Shaw, Black & Veatch (United States)

> Integrated Digital Twin and Hybrid Feedforward–Feedback Control for High-Performance Nitrification at a Full-Scale WRRF

***Jeffrey Sparks*, 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 Ng*, 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 Hermann*, 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 (NH_4/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 CO_2 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 Alizadehfard*, Osmotec (Australia)**

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 (NH_4/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 CO_2 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.

THEME 4: CLIMATE RESILIENT CITIES, FLOOD MANAGEMENT AND COASTAL PROTECTION

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

Session Chair:
Tony Wong, Monash University (Australia)

> **City Water Resilience Approach: Moving from Climate Diagnostics to an Enabling Environment for Urban Water Investment in Lagos State**

***Martin Shouler*, 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**

***Lydia Tsiami*, 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**

***Saleem Sarwar*, 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 Shibayama, Waseda University (Japan)

> Development of Planning and Design Parameters for Singapore's Coastal Protection Code of Practice (CP COP)

***Jen Yee Chin*, 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 Bos*, 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 Chan*, 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 m^3/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 Bos*, 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:
Eugene Chum, 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 Wu*, 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 Kwok*, 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 Shuttleworth*, 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 Hargreaves*, Arup (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:
Scott Dunn, AECOM (Singapore)
Carl Medriano, National University of Singapore (Singapore)

> Hong Kong's long-term integrated shoreline management strategies to cope with climate change

***Jay Cheng*, 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

***Christopher Benosky*, 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

***Dustin Atchinson*, 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 Shibayama, Chuo University (Japan)

> From Data to Decisions: Developing a Machine Learning Flood Forecasting Tool

Shivasorupy Barthiban, **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 Vaes, **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

Firmijn Zijl, **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 Ho, PUB, Singapore's National Water Agency (Singapore)
Carl Medriano, National University of Singapore (Singapore)

> SmartCoast: Monitoring Climate Change, Coastal Hazards Risk and Mangrove in Torres Strait with Digital Coastal Management Tool

Pearlyn Pang, **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 Chan, **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 Tandadjaja, **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 Halophilia ovalis. 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)

> **Presentation title TBC**

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

> **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**

***Gerard Pijcke*, Deltares (Singapore)**

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 feacal 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:
Fiona Waller, Independent Consultant (United Kingdom)
Joan Rose, Michigan State University (United States)

> Nature-Based Approaches for Mitigating Odor (MIB)-Producing Cyanobacteria in Source Water Reservoirs

Ming Su, **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

Jia Guo, **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 Microcystis aeruginos and Chlorella vulgaris, 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

Shoya Tanaka, **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

Kuo Xing Chong, **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 Cunliffe, SA Water (Australia)
Bruce Gordon, World Health Organization (Switzerland)

> Title TBC

***Daisuke Sono*, Tohoku University (Japan)**

> Optimizing Water Quality Events Detection Using Genetic Algorithms: A Comparative Study of Local and Global Models for Real-Time Monitoring

***Angelia Lau*, 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 Bijlmer*, 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 (Aliivibrio fischeri, "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 Sono*, 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 (Jbiofilm), conjugation-linked ARG transmission (Jconjugation), and metal resistance (Jmetal), supported by 12-hour measurements of biofilm OD_{550}, conjugation efficiency, total organic carbon (TOC), and ATP. Jbiofilm declined across treatments, Jconjugation showed suppression-including complete inhibition at 0.002–0.005 g/L ZnO- and Jmetal 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 Ndhlovu*, 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:
Ruchika Shiva, IRCWASH (India)
Gertjan Medema, KWR Water Research Institute (Netherlands)

> Title TBC

***Jay Bhagwan*, Water Research Commission (South Africa)**

> Reliable and Robust Solar-Powered Water Treatment Creates Sustainable Solutions for Rural Communities in Indonesia

***Andrew Shaw*, 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)

***Phillip Majeke, 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.

> Broad and Long-term Potential of Ammonia for Virus Inactivation in Non-sewered Sanitation System

***Putri Shafa Kamila*, 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

***Luyao Wang*, 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.

> Climate Resilience, Mitigation and Public Health: Measurement and Modelling of Safely Managed Sanitation Services in Indonesia

***Juliet Willetts*, 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_2O–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.

[TS5.5] EMERGING CONTAMINANTS IN WATER SYSTEMS: OCCURRENCE, ASSESSMENT, AND RISK MANAGEMENT

18 June 2026 (Thursday) | 2:00PM – 3:30PM | Room 9

Session Chairs:
Chee Meng Pang, PUB, Singapore's National Water Agency (Singapore)

> Risk assessment and management of per- and poly-fluoroalkyl substances in drinking water in New South Wales, Australia

Paul Byleveld, **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.

> An Integrated SWAT-Based Framework Using Global Datasets to Simulate Emerging Contaminants Across Multiple Watersheds

Marcus Joseph Sanchez, **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

Zhixin Li, **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.

> Organofluorine sum parameters for signalling PFAS burdens in environmental waters

Jingxiang Rockson Liu, **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.

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)

> **Presentation title TBC**

***Ana Soares*, Cranfield University (United Kingdom)**

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

***Sion Brackenbury*, Terraffix 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 TerrAffix'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 Na^+: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 Na^+: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.

[TS6.2] RESOURCE RECOVERY (2)

15 June 2026 (Monday) | 4:00PM – 5:30PM | Room 6

Session Chairs:
Wilbert Menkveld, Nijhuis Saur Industries (Netherlands)

> Hydrogen and Wastewater: Aligning Theoretical Synergies with Practical Realities in Co-Located Electrolysis Systems

Kate Murphy, **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

Eveline Ekklesia, **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

Jihoon Cheon, **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% $MgSO_4$ 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.

> Development of a Pilot-Scale Electrolyser for Seawater Lithium Extraction

Bicheng Huang, **Suntar International Group (Singapore)**

The rapid expansion of the electric vehicle industry has sharply increased global lithium demand, prompting renewed interest in seawater as a vast but underutilized lithium resource. Nevertheless, the extraction of lithium from seawater remains highly challenging due to its extremely low natural concentration (0.2 ppm) and the overwhelming presence of competing ions. In this work, we employ a pilot-scale electrolyser (2500 cm^2) capable of selectively enriching lithium directly from seawater. The system demonstrates an exceptional Li/Mg selectivity of 23,000, enabling the lithium concentration to be increased to 21 ppm. Future development will integrate this process with selective adsorbents and reverse osmosis to establish a continuous pathway for producing battery-grade lithium carbonate from seawater.

	[TS6.3] NATURE-BASED SOLUTIONS 16 June 2026 (Tuesday) | 2:00PM – 3:30PM | Room 6
	Session Chairs: *Dragan Savic,* KWR Research Institute (Netherlands)
>	**Nature-Based Solutions for Resilient, Liveable Cities – A Case Study on Cannery Creek**
	***Adam Cullen,* 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**
	***Claudia Yu,* 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**
	***Joost Buurman,* 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:
Heather Smith, Cranfield University (United Kingdom)

> Circular water cities – Who is winning in water reuse and why? A comparison of Australian Cities

***Celeste Morgan*, 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

***Phillip Majeke*, 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

***Marie Christelle Garcia,* 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) | 11:00AM – 12:30PM | Room 2

Session Chairs:
Adam Lovell, WSAA (Australia)

> Weighing up the options: Addressing uncertainty for the sustainable management of biosolids

***Erin Cini*, 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 van Nieuwenhuijzen*, 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

***Stephen Riches*, 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 AtkinsRéalis 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

***Bev Stinson*, 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
18 June 2026 (Thursday) | 2:00PM – 3:30PM | Room 4

Session Chairs:
Lucy Thomas, RSK Group (United Kingdom)

> Innovation ecosystems as enablers of circular water strategies: insights from Mediterranean regional dynamics

***Lucia Gusmaroli*, 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 To*, 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 Gaikwad*, 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.

LIST OF POSTER PRESENTATIONS

THEME 1: WATER NETWORK

> **Building Building Resilience from the Ground Up: Regional Hubs as a Pathway to Global Water Security**
Thinesh Selvaratnam, Lamar Universiy; Brian Williams, Lamar Universiy

> **Smart Barrier Modelling for Water Reuse: Digital Twin of Ozonation and UV Disinfection Based on EU Regulation**
Michael Ahmadi, Siemens AG; William Woods, Siemens AG

> **Revitalisation of Tsui Ping River**
Robert Santiago, AtkinsRealis

> **From Diagnostic To Prescriptive Digital Twins: Using Ai And Ml For Advancing Hydraulic Models of Water Networks**
Eland Afuang, Autodesk; Nathan Gerdts, Autodesk; Samer Muhandes, Autodesk

> **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

> **Climate Resilient Water Management for Arid Coastal Agricultural Zones: Integrated Stormwater, Groundwater & Tse Reuse Framework**
Saleem Sarwar, SMEC; Ketan KulKarni, Surbana Jurong

> **Agile Factory of the Future, Modularity in API production**
Reashika Das, Arcondis Life Sciences SG; Alessandro Nannarone, Arcondis Life Sciences; Giorgio Pesciullesi, Arcondis Life Sciences

> **Optimizing Nutrient Removal with Advanced Alyza IQ Analyzer for Wastewater Treatment**
Tao Su, Xylem Inc.

> **Two Tiers Overhead Tank For 24x7 Water Supply System In Haldwani Town, Uttarakhand: A Sustainable Solution**
Kashinath Halder, Tata Consulting Engineers Ltd.; Avdesh Dixit, Tata Consulting Engineers Ltd.; Shraddha Verma, Tata Consulting Engineers Ltd; Vinay Mishra, Uttarakhand Urban Sector Development Agency (GoU)

> **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.

> **Flow estimation in Water Pipelines using Acoustic Sensing**
Mustafa ALHAMDI, LWF Group Inc.; Gareth Lees, LWF Group Inc.; Igor Kolesnikov, LWF Group Inc.

> **World's Largest Hollow Fiber Nanofiltration (HFNF) Plant for Indirect Potable Reuse: Operational Experience from SAPAL León, Mexico**
Jink Gude, NX; Michiel Staatsen, Nx Filtration; Ignacio Garcia Martin, NX Filtration; Ignacio Diez, NX Filtration

> **Low Carbon Concrete Access Chambers for Sewer Networks: Enhancing Durability Against Microbiologically Induced Concrete Corrosion (MICC)**
Chunyang Deng, The University Of Sydney; Marjorie Valix, The University of Sydney

> **Real-Time Optical Water Quality Monitoring for Desalination, Aquaculture, and Environmental Protection: The Spectromarine Platform**
Girts Ozolins, Spectromarine; Aleksejs Zolotarjovs, Spectromarine; Gatis Tunens, Spectromarine

> **Modeling and Analysis of Water Pollution Accident in the Lower Nakdong River Using EFDC**
Park Hong-gi, Busan Water Authority; Dongyeong Kim, Busan Water Authority

> **Smart Lake Erie Watershed Initiative: Enabling Data-Driven Water Management and Innovation Across a Great Lake**
Max Herzog, Cleveland Water Alliance

> **Storm Surge Hindcasting Using a Pressure Drop–Driven Wind Model: A Practical Solution for Sparse Data Environments**
Jie Hu, Surbana Jurong; Adrian Lai, Surbana Jurong

> **Smart Leak Monitoring Using Xylem Vue: Driving Innovation Towards Advanced Applications**
Carlos Orea, Xylem

> **Machine Learning-Based Water Demand Forecasting in Metro Manila and Rizal, Philippines**
Franz Joseph Ryle Del Valle, Manila Water Company, Inc.; Eddie Aldrin Lumangaya, Manila Water Company, Inc.

> **Flood risk protection and reduction of damage through future-proof water and wastewater infrastructure**
Torsten Hackner, Huber SE; Firdaus Rahman, Huber Technology Asia-Pacific Ltd.

> **A Novel Framework for Flood Hazard Classification to Enhance Urban Flood Resilience**
Ken Hunu, Atkinsrealis

- **Mitigation of Climate Change Impacts on the Irrigated Agriculture in Central Asia**
  Kawa Baha, SMEC; Tigran Kalantaryan, SMEC; James Prothero, Surbana Jurong

- **Transforming Consultant Dependency into Sustainable Internal Capability: The Tauranga City Council Wedge Model**
  Asem Zabin, GHD; Theresa Wells, GHD

- **Raising the Floor on Wastewater Treatment: Global Lessons from the Recast Urban Wastewater Treatment Directive**
  Erina Brown, Atkins Realis; Peter Talboys, AtkinsRealis

- **Are mobile phone networks the underdog of smart metering?**
  Thomas Allen, RSK Group Plc

- **Hybridization of Stochastic Hydrological Models and Machine Learning Methods for Improving Rainfall-Runoff Modelling**
  Ezéckiel Houénafa Sianou, Pan-african University; Olatundji Johnson, University of Manchester, UK; Erick K. Ronoh, JKUAT University, Kenya; Steven E. Moore, University of Cape Coast, Ghana

- **'Jal HI AMRIT' - An Initiative to accomplish resource recovery and energy neutrality through operational excellence in Used Water Treatment Plants across India**
  Gaurav Bhatt, Arup; Thara D, Ministry of Housing and Urban Affairs; Tanvi Garg, Ministry of Housing and Urban Affairs; Isha Kalia, Ministry of Housing and Urban Affairs; Gurjeet Singh Dhillon, Ministry of Housing and Urban Affairs; Usha Garg, Mangement Consultant; Deepu Tom, Consultant

- **AI Optimisation of Membrane Cleaning in Wastewater Facilities**
  Pedram Sadr, OSMOTEC; Mohammad Alizadehfard, Osmosis Technology & Engineering Company (OSMOTEC)

- **Deployment of Acoustic Monitoring on Transmission Main Network Using a Data-as-a-Service Model**
  Mohamad Iznul Muazim, Mueller Water Products; Harry Low, PUB

- **Application of Machine Learning (ML) Techniques for Water Quality Assessment in a Water Treatment Plants**
  Lindelwa Ndhlovu, Department Of Water And Sanitation

- **Managing Stormwater And Marine Spills In Ports: The Port Of Taranto As A Global Best Practice**
  Stefano Biondi, Swigroup; Ing. Alessandro Buzzacchino, Taranato Port Authority; Ing. Luigi Severini, IL Studio

- **Leak Detection on Singapore's transmission main network with EchoShore-TX**
  Ramakrishnan Madhavaneswaran, Mueller Water Products; Harry Low, PUB; Zohreh Andalibi, Mueller Water Products; Adiv Paradise, Mueller Water Products; Marcin Kloc, Mueller Water Products; Valentin Burtea, Mueller Water Products

- **E-Notification System for High Consumption Investigation for 15mm meters**
  Jun Ying Tan, PUB; Qiu Feng Ong, PUB; Brenda Lai, PUB

- **Implementation of an Advanced Biological Nutrient Removal Monitoring System for Enhanced Process Control and Troubleshooting**
  Melody White, In-Situ; Scott Kahle, In-Situ

- **Effective Ammonia Based Aeration Control Using On-Line Process Colorimetry with an Innovative Disposable Filter**
  Melody White, In-Situ

- **Active Energy Recovery Devices To Enable Lower Power Consumption - Mpe 70 Operation Results**
  Francisco Jimenezcastellanos Lucena, Danfoss

- **Complementary Modelling Analysis And Experimental Investigation of Performance-Limiting Factors Of Electrochemical Membrane Systems For Chemical-Free Ph Regulation**
  Liyue Diao, Nanyang Technological University; Wei Long, Nanyang Technological University; Hong Li, Nanyang Technological University; Qianhong She, Nanyang Technological University

- **AI-Driven Intelligent Sensing of Sewer Network Inflow Prediction From Wet-Well Dynamics**
  Mofei Han, CSD Water Service Co. Ltd; Jun Chen, CSD Water Service Co. Ltd; Feiyi Li, CSD Water Service Co. Ltd; Yingnan Zhu, CSD Water Service Co. Ltd

THEME 2: WATER TREATMENT

> **Turning A Drinking Water Treatment Digital Roadmap Into Reality In Northern Netherlands: The First Digital Twin For UV/H2O2 Treatment**
Giacomo Bellandi, AM-Team ; Jessica Ianes, AM-Team ; Pieter Vlasschaert, AM-Team ; Khalid El Tayeb El Obied, PWN ; John Boogaard, PWN ; Suze Van Der Meulen, PWN ; Wim Audenaert, AM-Team

> **From Data To Dosing: Smart Operation Of Full-Scale Coagulation Processes Based On Artificial Intelligence**
Mathieu Coge, AM-Team ; Giacomo Bellandi, AM-Team ; Sven Kempeneers, Water-Link ; Tine Deckers, Water-Link ; Gert Verschooten, Water-Link ; Wim Audenaert, AM-Team

> **Rethinking Full-Scale Ozonation Reactor Design: 3D CFD-AMOZONE Modelling For The HRSD Nansemond SWIFT Indirect Potable Reuse Facility**
Roberta Muoio, AM-Team ; Giacomo Bellandi, AM-Team ; Robert Pearce, HRSD ; Danny Murphy, Carollo Engineers ; Pieter Vlasschaert, AM-Team ; Tracy Lewis, Tetra Tech ; Charles Bott, HRSD ; Wim Audenaert, AM-Team

> **Towards Chemical-Free Nitrogen Recovery: Advancing Resource-Recovery Oriented Wastewater Treatment**
Tuur Van Den Eijnde, Nijhuis Saur Industries ; Wilbert Menkveld, Nijhuis Saur Industries ; Rodrigo Haro, Nijhuis Saur Industries

> **Demonstration Of Flat-Sheet Ceramic Membrane For The Pre-Treatment Of SWRO By Retrofitting Into DAF System At Tuas Desalination Plant (TDP)**
Hiroshi Noguchi, Meiden Singapore Pte Ltd ; Seetharaman Krishnan, Meiden Singapore Pte Ltd ; Su Chin Lee, Meiden Singapore Pte Ltd ; Oo Htun, Meiden Singapore Pte Ltd ; Terutake Niwa, Meiden Singapore Pte Ltd ; Akitoshi Nakagawa, Meidensha Corporation ; Noriaki Kanamori, Meidensha Corporation ; Hideya Shiraishi, Meidensha Corporation ; Brenda Rui Lin Tan, National University Of Singapore ; Zhong Sheng Tai, National University Of Singapore ; Jiangyong Hu, National University Of Singapore ; Na Peng, PUB ; Lei Liu, PUB ; Qin Wei Chow, PUB ; Ong Key Wee, PUB

> **Brackish Water Desalination: A Strategic Imperative For Sustainable Water Stewardship In American Landscape**
Ghazi Ozair, BW Water Americas ; Andrew Zaske, BW Water Americas ; Fadey Kassim, BW Water Americas

> **Transforming Cooling Tower Sustainability With Nature-Based, Plug-And-Play Vortex Technology: Achieving 50% Water Savings, 95% Reuse, And Advancing Net-Zero Goals**
Alain Mestat, H2O Vortex

> **Upgrading Choa Chu Kang Waterworks: From Conventional to Advanced Water Treatment**
Shi Hui Wong, PUB ; Ee Chyi Toh, PUB ; Wee Leong Yeo, PUB ; Melvin Koh, PUB

> **Lithium Recovery From Seawater Desalination Brines Using Ion-Sieve Electrospun Nanofibrous Membranes: The Role Of Nanofiber Design**
Naeem Nadzri, Nanyang Technological University ; Yu Jie Lim, Nanyang Technological University ; Xiangjun Liao, Tianjin Normal University ; Yejin Liang, Nanyang Technological University ; Kunli Goh, Nanyang Technological University ; Yuan Liao, Great Bay University ; Atsushi Goto, Nanyang Technological University ; Rong Wang, Nanyang Technological University

> **Advancing Water Circularity And Decarbonization: A Novel Treatment Pathway For Cyanide-Contaminated Wastewater**
Mohsin Ahmad, Samaa Technologies Co. Ltd

> **Domestic-Industrial Nexus In Water Supply, Treatment And Reuse- Using "Tigreen" Waste Water Recycle System. Powered By The Radical-Bubble Generator**
> Jayarama Innanje, Swipegreen Pte Ltd

> **Advancing Water Sustainability Through A Novel Hybrid Electrochemical-Membrane Process**
Weiyi Pan, National University Of Singapore ; Debashis Roy, Indian Institute Of Science (India); Prof Jovan Kamcev, University Of Michigan ; Menachem Elimelech, Rice University

> **UV/H2O2 Advanced Oxidation For NDMA And 1,4-Dioxane Control In Potable Reuse Applications - Mechanistic Modeling And Experimental Validation**
Sebastian Gustafson, ULTRAAQUA A/S ; Morten Klausen, ULTRAAQUA A/S

> **Development Of Analytical Method For Psychoactive Drugs In Water Using LC-MS-MS**
Jaewon Jeong, Busan Water Authority (South Korea); Minjeong Kim, Busan Water Authority (South Korea)

> **BODAC; A Sustainable Biological Regenerable Activated Carbon Filter For Biofouling Control And Micropollutant Removal**
Hendrik Menkveld, Nijhuis Saur Industries ; Gerrit Veenendaal, Nieuwater B.V. ; Niels De Hart, Nijhuis Saur Industries

> **High-Rate DAF For Desalination Applications With Up To 60% Footprint Reduction Using Advanced Plate Pack Technology For Superior Removal Of Algae And Solids**
Hendrik Menkveld, Nijhuis Saur Industries ; Patricia Lema, Nijhuis Saur Industries ; Patrick Arink, Nijhuis Saur Industries

> **Mechanistic Exploration of Responsive RE-MOF Coordination: Arsenic Sorption Kinetics In Batch Environment**
Shashi Bhushan Singh, Indian Institute Of Technology Guwahati (India); AHANA DUTTA, Indian Institute Of Technology Guwahati (India); BISHNUPADA MANDAL, Indian Institute Of Technology Guwahati (India)

> **Pretreatment Of Algae-Impacted Seawater: Improving Efficiency of In-Line Coagulation Coupled with Ceramic Membrane Filtration**
Brenda Rui Lin Tan, National University of Singapore; Zhong Sheng Tai, National University of Singapore; Hiroshi Noguchi, Meiden Singapore Pte Ltd; Sungwoo Bae, Korea University (South Korea); Jiangyong Hu, National University of Singapore; Na Peng, PUB; Lei Liu, PUB; QW Chow, PUB; KW Ong, PUB

- **Boron Removal For Microelectronics by New Generation High-Flow Edi Stacks Harnessing Dilute Outlet As Concentrate Feed**
  Avijit Dey, Aquatech International

- **Configuring A Liquid State High-Entropy Metal Alloyelectrocatalyst**
  Sahar Nazari, UNSW (Australia); Mohammad Alizadehfard, Osmosis Technology & Engineering Company (OSMOTEC) (Australia)

- **Plasma-Treated Tio2 Photocatalysts On Unisol Membranes For PFAS Removal**
  Somaiyeh Allahyari, Sahand University Of Technology (Iran); Nader Rahemi, Sahand University Of Technology (Iran); Mohammad Alizadehfard, Osmosis Technology & Engineering Company (OSMOTEC) (Australia)

- **Elucidating The Mechanisms of Ion Transport Dependent Scaling And Its Influence On Acid-Base Production In Bipolar Membrane Electrodialysis**
  Yuqin Ni, Nanyang Technological University ; Hong Liu, Nanyang Technological University ; Assoc Prof Qianhong She, Nanyang Technological University

- **Monitoring And Control Of Peracetic Acid In Water Pre-Oxidation and Disinfection Applications**
  Vadim Malkov, Hach ; Scott Tucker, Hach ; Paul Handke, Process Applications Inc. ; Sarah Kocak, Municipal Authority Of Westmoreland County - Mckeesport WTP

- **Proactive Manganese Control Via Real-Time DO Monitoring In Source Water**
  Vadim Malkov, Hach ; Phil Brandhuber, Brandhuber Water Quality & Treatment LLC ; Jacob Stephani, Soldier Canyon Filtration Plant

- **Multi-Pass Reverse Osmosis: Novel Approaches For Brine Minimization For Ultrapure Water Systems**
  Dor Tal, ROTEC (Israel); Regev Levi, ROTEC (Israel)

- **Engineering Bimetal Synergy In MOF Frameworks For High-Flux Adsorption Of Persistent Organic Pollutants**
  Ahana Dutta, Indian Institute Of Technology Guwahati (India); Shashi Bhushan Singh, Indian Institute Of Technology Guwahati (India); Bishnupada Mandal, Indian Institute Of Technology Guwahati (India); Lal Mohan Kundu, Indian Institute Of Technology Guwahati (India)

- **Resilient Compact High-Rate Clarification: Stable Water Supply With Reduced Chemical Demand**
  Aljon Balatbat, BW Water

- **Brine Concentration Strategy**
  Val Frenkel, Tylin International

- **Isolation And Characterization Of Hexavalent Chromium Reducing Bacteria For Application In Microbial Fuel Cell Using A Low-Cost Proton Exchange Membrane**
  Piyush Jha, Vasudeva Innovations (India); Vijay Samuel Gnanarathinam, Hindustan Institute Of Technology & Science (India); Sandhya Jayakumar, Hindustan Institute Of Technology & Science (India)

- **Electro-Oxidation For Cooling Towers: A Breakthrough In Sustainable Data Center Water Management**
  Lakshmi Jothinathan, Hydroleap Private Limited ; Mohammad Sherafatmand, Hydroleap Private Limited ; Kaniasan Gunalan, Amazon Web Services

- **Restoring Polluted Urban Drains: Nanobubble-Driven Aeration, Oxidation, And Filtration In The Mungeshpur Drain, Haryana, India**
  Aman Kapur, NICO Nanobubble India Pvt. Ltd. (India); Amit Kapur, NICO Nanobubble India Pvt. Ltd. (India); Anant Kapur, NICO Nanobubble India Pvt. Ltd. (India); Vinod Vadivel, NICO Nanobubble India Pvt. Ltd. (India)

- **Prolonged Operating Cycle And Enhanced Removal Of Emerging Contaminants In Slow Sand Filters: Significance Of Algae-Bacteria Interaction**
  Jing Qi, Research Center For Eco-Environmental Sciences, Chinese Academy Of Sciences

- **From The Cradle To The Full Grown - The Path To A New Product Line**
  Christian Goebbert, Acuriant Technologies ; Anke-Gundula Roth, Acuriant Technologies ; Kristin Remus, Acuriant Technologies

- **Efficiency Evolution: Axial Piston High-Pressure Pump Solutions For Enhanced Plant Operations**
  Francisco Jimenezcastellanos Lucena, Danfoss

- **Active Energy Recovery Devices To Enable Lower Power Consumption - Mpe 70 Operation Results**
  Francisco Jimenezcastellanos Lucena, Danfoss

- **Complementary Modelling Analysis And Experimental Investigation Of Performance-Limiting Factors Of Electrochemical Membrane Systems For Chemical-Free Ph Regulation**
  Liyue Diao, Nanyang Technological University ; Wei Long, Nanyang Technological University ; Hong Li, Nanyang Technological University ; Qianhong She, Nanyang Technological University

- **AI-Driven Intelligent Sensing Of Sewer Network Inflow Prediction From Wet-Well Dynamics**
  Mofei Han, CSD Water Service Co. Ltd ; Jun Chen, CSD Water Service Co. Ltd ; Feiyi Li, CSD Water Service Co. Ltd ; Yingnan Zhu, CSD Water Service Co. Ltd

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

> **From Data to Decarbonization: Proactive N2O Emission Control Using Validated Predictive Models at Singapore's WRPs**
Giacomo Bellandi, AM-Team; . Yangshuo Gu, PUB; Eng Liyun TAI, PUB; Xiao Qiang King, PUB; Eng. Guo Xiang Liew, PUB; Eng. Bee Hong Kwok, PUB; Eng Pieter Vlasschaert, AM-Team; . Guihe Tao, PUB; . Wim Audenaert, AM-Team

> **Industrial Scale Fabrication and Applications of Low Energy Reinforced Membranes for Desalting**
Wanting Wang, Separation Technologies Applied Research and Translation; Zhiwei Thong, Separation Technologies Applied Research and Translation; Mdm Li May Goh, Separation Technologies Applied Research and Translation

> **Enhancing Electrical Asset Resilience using E-House Solution**
Hak Jan Loo, PUB, Singapore's National Water Agency; Jun Wei Ter, PUB, Singapore's National Water Agency; Seng Gok Tan, PUB, Singapore's National Water Agency

> **Operational Excellence in Wastewater Unlocking Resilience and Efficiency**
Paul Banfield, Atkinsrealis

> **Demonstration of World's First Integrated Aerobic Granular Sludge (AGS)-MBR**
Liyun Tai, PUB; Roger Pung, Haskoning

> **Green (P-free) Antiscalants and reducing Phosphorus in Industrial Waste**
Venketeswari Parida, Gradiant; Steven Lam, Gradiant

> **Assessing Emerging Alternatives to Incineration for Pharmaceutical Aqueous Waste**
Reashika Das, Arcondis Life Sciences SG; Floriane Leseur, Arcondis Life Science; Gabriella Meinberg, Arcondis Life Science; Leonard Albert, Arcondis Life Sciences

> **Lab-scale Experimental Validation of Lower Fouling Tendency of Semi-closed Reverse Osmosis (SCRO) Compared with Single Stage Reverse Osmosis (SSRO)under Desalination Conditions**
Yifu Xiao, Nanyang Technological University; Doctor Dan Li, Nanyang Technological University; Doctor Zijing Mo, Nanyang Technological University; Anthony.G Fane, UNESCO Centre for Membrane Science and Technology, School of Chemical Engineering, The University of New South Wales (UN; Assoc. Qianhong She, Singapore Membrane Technology Centre, Nanyang Environment & Water Research Institute, Nanyang Technological University

> **Demonstration of Plug-Flow Anaerobic Sludge Digesters at Different SRTs at Water Reclamation Plant in Singapore**
Danny Traksel, Haskoning; Valerie Sels, Haskoning; Eddie Koornneef, Haskoning; Guihe Tao, PUB; Yangshuo Gu, PUB; Yangnan Li, PUB; Jiawei Ng, PUB; Brad Ngu, Mattenplant; MSc See Leng Ong, PUB; Zequan Yeo, Mattenplant; Evonne Ho, Mattenplant; Ramon Zwaan, Haskoning

> **Rehabilitation Of Existing Trunk Sewer Using CIPP Lining In Nainital And 11 MLD Capacity STP In Two Tiers In Dehradun**
Jitendra Tyagi, Tata Consulting Engineers Limited; Sanjay Lalan, Tata Consulting Engineers Limited; Rahul Yadav, Tce; Vinay Mishra, UUSDA

> **Hydrolysis-oxidation Pretreatment of Erythromycin Production Wastewater: Mitigation of Biological Inhibition and Enhancement of Anaerobic Membrane Bioreactor Performance**
Chen Wang, Research Center for Eco-environmental Sciences, Chinese Academy Of Sciences; Yu Zhang, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences

> **Optimization of Coagulant and Flocculant in Backwash Recovery System**
Keizer Bihasa, BW Water; Chantelle Wang, BW Water

> **Evaluating the Impact of MBR Permeate Quality and Variability on Reverse Osmosis Performance for Wastewater Reuse**
Julia Leroy, Suez; s Flavia Zraick, Suez; Zoé Dorkel, Suez

> **Wastewater Decarbonisation – from understanding to action**
an Ho, Ghd; Jeremy Kraemer, GHD; Aby Sabzwari, GHD

> **Dynamics of granules and floc inventory in full scale municipal WWTP: Model response, gaps and future needs**
Farhang Forouzanmehr, Suez

> **Industrial Wastewater Solutions for Water-Stressed Economies: Performance, Barriers and Scaling Pathways from SMEP Pilot Projects**
Nura Suleiman, Pegasys/RSK; Elzette Henshilwood, SouthSouthNorth; Jeremy Richardson, Pegasys; Amanda Dinan, SouthSouthNorth

> **Enhanced RO Reject Recovery Through Innovative System Design**
Xiangyi Qiao, Xylem Water Solutions Singapore Pte Ltd; Jacob Telepciak, Xylem LLC; . Vincent Wu, Xylem Water Solutions Singapore Pte Ltd

> **The Triple Carbon Reduction Project : Reducing GHG Emissions with MABR**
Barry Heffernan, Oxymem; Guilia Pizzagalli, Anglian Water; Blessing Mobolaji, Cranfield University; Bruce Jefferson, Cranfield University; Amanda Lake, Jacobs; Josep Manzano, Oxymem; Andras Nemeth, Oxymem; Korneel Caron, Oxymem

> **Enhanced Nitrogen Removal in Warm Climates Using MABR Technology**
Piaras Kyne, OxyMem Ltd; Julia Bailey, Water Corporation; Barry Heffernan, OxyMem Ltd; Josep Manzano, OxyMem Ltd

- **Machine Learning-Based Raw Water Quality Forecasting for Laguna de Bay Treatment Plant Intakes**
  Franz Joseph Ryle Del Valle, Manila Water Company, Inc.; Eddie Aldrin Lumangaya, Manila Water Company, Inc.
  A New Method for Reclamation of Nutrients and Clean Water from Manure and Digestate
  Carsten Persner, GEMÜ

- **Risk assessment and management in drinking water supplies in the absence of robust epidemiological and toxicological information The Role of Industry Standards**
  Jerome Logie, NSF

- **A Practical Approach for the Detection and Quantification of Chloronitramide Anion in Water**
  Danence Lee, PUB; Zhi Siang Toh, PUB; Junqi Yue, PUB; Zhongxian Guo, PUB; Yan Huang, PUB; Lifeng Zhang, PUB
  Reinforced Osmotic Membranes with High Mass transfer for High Pressure Retarded Osmosis Process
  Wanyu Li, Nanyang Technological University; Dan Li, Nanyang Technology University; Yuting Qian, Nanyang Technological University; Hong Liu, Nanyang Technological University; Assoc Qianhong She, Nanyang Technological University

- **The Benefits of Combining Advanced Anaerobic Digestion using Thermal Hydrolysis and Pyrolysis**
  Julien CHAUZY, Cambi

- **Removal of Organics/PFAS with Thermal Responsive Hollow Fibre Membrane**
  Chin Ann Chow, Nanyang Technological University - Ntuitive (START Centre); Li May Goh, Nanyang Technological University - NTUitive (START Centre); Farhanah Esa, Nanyang Technological University - NTUitive (START Centre)

- **The multiplier benefits of integrating household sanitation into wastewater-treatment infrastructure**
  Liron Friedman, Columbia University; . Doulaye Kone, Bill and Melinda Gates Foundation; . Kartik Chandran, Columbia University

- **Phytoremediation potential of water hyacinth in Centralized Water treatment Facility**
  Glenis Ann Valenzona, Fpip Utilities Inc.

- **Industrial Water Sustainability from SBTN and Real-World Water Conservation Perspectives**
  Mitchell Dixon, Ramboll; s Eveline Ekklesia, Ramboll

- **Hydraulic Model Calibration of Separate Sewerage System Framework, Automation and Local Insights from Singapore**
  Pei Qi Yeo, DHI Water & Environment; Xin Huei Wong, DHI Water & Environment; Veradej Phipatanasuphorn Phipatanasuphorn, Dhi Water & Environment; Vivian Noo, PUB; Tamilarresan Ravichanthiran, PUB; William Ong, DHI Water & Environment; Su Jun Lau, PUB; Xiaohua Wei, PUB; Celest Ho, PUB

- **The High Stakes of High Recovery: Reverse Osmosis Challenges in PFAS and 1,4-Dioxane Removal**
  Dor Tal, ROTEC; Shina Lauz, ROTEC; Yair Schnurmacher, ROTEC

- **The Impact of Phosphorus on Sludge Dewaterability**
  Parusu Ramakrishnan, Water Corporation; Binod Agarwalla, Water Corporation; Jeffrey Sloan, Water Corporation

- **Effect-Based Monitoring of Dioxin-like and Estrogenic Compounds in Highly Purified Recycled Water**
  Zuhairah Hanafi, PUB; Caiping Feng, PUB; Wan Shoo Cheong, PUB

- **Industrial Reuse - An Essential Contribution to Water Resiliency in the Mega City of Chennai, India**
  Josef Lahnsteiner, VA TECH WABAG; P. S. S. Murugan, VA TECH WABAG Ltd, India; Vinod P. Bharati, VA TECH WABAG Ltd, India; B. K. Kumaran, VA TECH WABAG Ltd, India

- **A Novel Phosphorus Recovery by Ferric Reduction -Fluidized Bed Crystallization emitted from FTF-LCD Wastewater**
  Po I Liu, Industrial Technology Research Institute (ITRI); Kate Hsu, Industrial Technology Research Institute (ITRI); . Hao Xiang Xu, Industrial Technology Research Institute (ITRI); Wei Chieh Chin, Industrial Technology Research Institute(ITRI); I Hsuan Lin, Industrial Technology Research Institute (ITRI)

- **Evaluating Biochar as an Adsorbent for the Removal of Antiretrovirals from Surface Waters Impacted by Informal Settlements**
  Kalpana Maraj, University of Cape Town; Associate essor Anwar Jardine, University of Cape Town; Associate essor Kevin Winter, University of Cape Town

- **Perfluoroalkyl Substances (PFAS) Removal by Granular Activated Carbon (GAC) Adsorption Using Rapid Small-Scale Column Tests (RSSCT)**
  Yelong Chen, National University of Singapore;. Daryl Weatherup, De Nora

THEME 4: CLIMATE RESILIENT CITIES, FLOOD MANAGEMENT AND COASTAL PROTECTION

> **Probabilistic Estimation of Waterfront Design Levels with Multivariate Dependence Modeling**
Julio Garcia-Maribona Lopez-sela, DHI

> **Drainage Improvement Works in Wong Tai Sin and North District, Hong Kong Special Administrative Region (HKSAR), China**
Calvin Chi Wa Li, WSP (Asia) Ltd; Danny Yiu Pong Leung, WSP (Asia) Ltd.; Ben Ho Pan Tong, WSP (Asia) Ltd.; Myron Man Him Eng, WSP (Asia) Ltd.

> **Digital Twins for Flood Resilience: A Systematic Review**
Jonathan Koon Ngee Tan, CFI Singapore; Adrian Wing Keung Law, CFI Singapore

> **Characterizing the Role of Microbes in Soil Nutrient Cycling, in Tropical Soils**
Kavindra Yohan Kuhatheva Senaratna, National University of Singapore; Shu Harn Te, National University of Singapore; Simone Fatichi, National University of Singapore; Hongjuan Han, Public Utilities Board, Singapore; Yew-Hoong, Karina Gin, National University of Singapore

> **Scalable Flood Risk and Nature-Based Adaptation Modeling with WaterProof 2.0 for Climate-Resilient Cities**
Carlos Rogeliz, The Nature Conservancy; Jonathan Nogales, The Nature Conservancy; Pilar Galindo, The Nature Conservancy; Miguel Cañon, The Nature Conservancy

> **Saturated Soil Hydraulic Conductivity Analysis over Different Land Use in Singapore**
Fuyang Lin, National University Of Singapore; Kavindra Senaratna, National University of Singapore; Shu Harn Te, National University of Singapore; Karina Gin, National University of Singapore

> **Nature Positive Water: A Practical Framework For Utilities**
Erin Cini, Water Services Association Of Australia; Jason Mingo, Water Services Association of Australia; Sarah Martin, Water Services Association of Australia

> **A Framework For Constructing Future Sea Water Level For Resilient Coastal Protection**
Kuifeng Zhao, Surbana Jurong Consultants Pte. Ltd; Jie Hu, Surbana Jurong Consultants Pte. Ltd; Adrian Chun Hin Lai, Surbana Jurong Consultants Pte. Ltd; Yaodong Zhang, Surbana Jurong Consultants Pte. Ltd

> **Coastal Flood Risk Opimisation: Singapore's Framework for Flood Protection Standards**
Matthijs Bos, Haskoning

> **An Unstructured, Nested WAVEWATCH III Framework for Equatorial Straits: Development, Validation, and Downscaled CMIP6 Projections for the Sunda Shelf**
Xingkun Xu, National University of Singapore; Pavel Tkalich, National University of Singapore

> **Integrating Field Measurements, Machine Learning and AIS Data for Enhanced Ship Wake Prediction**
Haoliang Wu, DHI Water & Environment (S) Pte Ltd; Tomy Padiyara Noble, DHI Water Environments (UK) Ltd; Caroline Paugam, Fugro Singapore Marine Pte Ltd; MengJie Liew, DHI Water & Environment (S) Pte Ltd; Cheng Ann Tan, DHI Water & Environment (S) Pte Ltd

> **Feasibility of coastal barriers in Southwestern Singapore**
Jen Yee Chin, Jacobs; Shu Yi Chow, Jacobs

> **Strategic and Technical Nature-Based Solution Guidelines for Flood Risk Management in Indonesia**
Tiara Salsabila, PT Witteveen+Bos Indonesia; Tom Wilms, Witteveen+Bos Raadgevende ingenieurs B.V.; Mohammad Irfan Saleh, Ministry of National Development Planning (Bappenas); Titih Titisari Danielani, Ministry of National Development Planning (Bappenas); s Aruminingsih Aruminingsih, Ministry of National Development Planning (Bappenas); s Anggun Etika Putriasri, Ministry of Public Works (PU)

> **Field investigations of suspended and bed sediment characteristics in eastern coastal waters of Singapore**
Hieu Trung Kieu, National University Of Singapore; . Ha Linh Trinh, National University of Singapore; . Dawn Sok Cheng Pang, National University of Singapore; . Adrian Wing-Keung Law, National University of Singpore

> **Field Wave Monitoring and Characterisation with a UAV Dual-Camera Stereo Vision Approach**
Baoxin Jiang, Nanyang Technological University; Fanxu Zeng, Nanyang Technological University; Chun Yang, Nanyang Technological University; Adrian Wing Keung Law, National University of Singapore; Devin Guan Seng Lee, PUB

> **Smart Water Resilience: From Wildfire Lessons to Seismic Strength**
Marisa Escobar, Consultant

> **Urban Rainfall Monitoring Using Commercial Microwave Links: A Hybrid Scientific Deep Learning Approach**
Htet Naing, Hydroinformatics Institute; Gineesh Sukumaran, Hydroinformatics Institute; Rausyan Ardi Burham, PUB; Wing Ken Yau, PUB; Maarten Keijzer, Hydroinformatics Institute

> **Developing a Data-iven Early Warning Framework for StormSurges**
Elisa Yun Mei Ang, Singapore Institute Of Technology; Zhijing Feng, Singapore Institute Of Technology; Farzin Samsami, National University of Singapore; Zhi Yung Tay, Singapore Institute Of Technology; Hui An, Singapore Institute Of Technology; Xiaorong Li, Singapore Institute Of Technology; Kheng Lim Goh, Newcastle University in Singapore; Peng Cheng Wang, Singapore Institute Of Technology

> **Developing phase-resolving nearshore coupled models for Singapore Strait**
Haihua Xu, Tropical Marine Science Institute; Pavel Tkalich, Tropical Marine Science Institute

THEME 5: WATER QUALITY AND ONE HEALTH

- **A Comparative Assessment of Two Total Organic Carbon (TOC) Methods in the Analysis of High Purity Waters**
  Wei Xiang Raymond Ong, PUB; Wendy Zhang, PUB; Liam Woon Cheryl Ong, PUB

- **Air Selangor's Comprehensive VOC Surveillance for Safe Drinking Water**
  Davis Jawa Tius, Pengurusan Air Selangor Sdn Bhd

- **Virus Removal (indicators) by Nature-based Water Treatment**
  Gertjan Medema, KWR Water Research Institute; Bas van der Zaan, KWR Water Research Institute

- **Fit-for-Purpose PBTK-IVIVE Approach for Predicting Pathway-Specific Human Equivalent Doses of Phenolic EDCs: Implications for Health Risk Assessment**
  Yiping Xu, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences; Mei Ma, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences; Kaifeng Rao, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences

- **Assessment of Alternative Algaecides as Mitigating Measure for Reservoir Water Quality Management**
  Kai Jie Chia, Singapore Institute of Technology; Xiaochen Liu, PUB; Glenda Tan, PUB; Candice Goh, PUB; Wai Sum, Grace Chan, PUB; The Cuong, Richard Dang, PUB

- **A Simple and Sensitive Analytical Method for Strontium-90 in Fresh Water**
  Daisy Setyono, PUB; Zhongxian Guo, PUB

- **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

- **Odor-causing Compounds In Drinking Water: Identification, Occurrence And Their Multidimensional Risk**
  Chunmiao Wang, Research Centre for Eco-Environmental Sciences, Chinese Academy of Sciences

- **A Critical Review of Microplastics in Michigan's Freshwater at the Heart of the Great Lakes**
  Ellie Sibula, Michigan State University; Joan Rose, Michigan State University; Yoorae Noh, Michigan State University

- **Establishment of an AI-Based Phytoplankton Identification System and its Application as an Environmental Indicator**
  Han Leong Low, Zweec Analytics Pte Ltd; Chuan-Ling Chou, Algae Field Ecological Co, Ltd

- **Defining Hydration Through Nanobubble Oxygenation: IOTA WATER as a Safe, Functional Bottled Water Solution**
  Anant Kapur, IOTA WATER (M/s IOTA Nanotechnology Pvt Ltd); Aman Kapur, IOTA WATER (M/s IOTA Nanotechnology Pvt Ltd); Amit Kapur, IOTA WATER (M/s IOTA Nanotechnology Pvt Ltd)

- **Investigation On The Impact Of Climate Change On Drinking Water Distribution Systems Via A Multi-Stage Pipeline System**
  Zhong Sheng Tai, National University of Singapore; Liyan Li, National University of Singapore; Yuanpeng Sun, National University of Singapore; Yuyao Fu, National University of Singapore; Sungwoo Bae, Korea University; Say Leong Ong, National University of Singapore; Jiangyong Hu, National University of Singapore; Elaine Puay Hoon Quek, PUB; Phen Wei Chue, PUB

- **Microplastic Contamination and Release Mechanisms in River Environments**
  Sukanya Krishnan, Michigan State University; Maede Dashtpeima, Michigan State University; Yoorae Noh, Michigan State University

- **Determination of Propylene Glycol in Water Sample After Derivatization with Benzoyl Chloride by HPLC-MS/MS**
  Jingming Wu, PUB; Yan Huang, PUB; Lifeng Zhang, PUB

- **Determination of Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD5) in Water Samples by Automated Platforms**
  Jing Ping Toh, PUB; Wendy Zhang, PUB; Raymond Ong, PUB

- **Large-scale biomanipulation and food-web modelling to manage water quality in an Urbanised Reservoir in Singapore**
  Candice Goh, PUB

- **Critical Review of PFAS Treatment Technologies and Policy Implications for South Korea**
  Keumbee Kim, Sungkyunkwan University; Am Jang, Sungkyunkwan University

THEME 6: NEXUS & RESOURCE CIRCULARITY

- **Physics-Informed AI for Cooling Tower Optimization: A Case Study in the Food & Beverage Industry**
  Maher Damak, Infinite Cooling; Karim Khalil, Infinite Cooling; Jimmy Yu, PepsiCo; Wenny Noha, PepsiCo

- **Coupling a Hydrodynamic Model with an Individual-Based Mangrove Model to Quantify Two-Way Interactions and Assess Hybrid Coastal Protection Solutions**
  Zhian Lin, National University of Singapore; Sheng Huang, National University of Singapore; Xuneng Tong, City University of Hong Kong; Karina Yew-Hoong Gin, National University of Singapore

- **Water Resilience Tracker – National and Regional-Scale Integration of Water in NDCs and NAPs**
  Martin Shouler, Arup; Arron Cox, Arup; Francisco Fuenzalida Concha, Arup; Wanja Wamae, Arup; Idrees Malyar, Alliance for Global Water Adaptation (AGWA); Greenwell Matchaya, International Water Management Institute (IWMI); Darshini Ravindranath, International Water Management Institute (IWMI); Mphatso Kalemba, International Water Management Institute (IWMI); Harm Duel, Deltares; Judith ter Maat, Deltares; Umit Taner, Deltares; Kirsten Smith, Arup

- **A SWAT-based assessment of the impacts of land cover on hydrology and soil loss in the T35A Quaternary Catchment, Eastern Cape**
  Esihle Gotye, Department of Water and Sanitation

- **Water as a Battery**
  John Ferguson, Danfoss; Georg Herborg, Danfoss; Francisco Jiminez-Castellanos, Danfoss

- **Optimizing Treated Sewage Effluent Management for Water Security and Sustainability Through Flow Management**
  Ali Al-marri, PWA

- **Ultra-Microporous 2D Covalent Organic Frameworks for Carbon Dioxide Capture**
  Wei Zhao, National University of Singapore; He Li, National University of Singapore; Jia Wang, PUB; Yan Gu, PUB; Azhar Ismail, PUB; Hwee Sin Tan, PUB; Yunita Tan, PUB; Gurdev Singh, PUB; Dan Zhao, National University of Singapore

- **Determining the carbon footprint of biogas production and use**
  William Barber, Cambi, Inc.

- **Brine as a source for decarbonization together with sustainable carbonates production**
  Yan Liu, Institute of Sustainability for Chemicals, Energy and Environment, A*STAR; Pitchai Thangasamy, Institute of Sustainability for Chemicals, Energy and Environment; Jiajian Gao, Institute of Sustainability for Chemicals, Energy and Environment; Truong-Giang Vo, Institute of Sustainability for Chemicals, Energy and Environment; Su Wang, Pan-United Corporation Ltd; Iskandar Halim, Institute of Sustainability for Chemicals, Energy and Environment; Sze Shiong Choo, Institute of Sustainability for Chemicals, Energy and Environment; JiaE Zheng, Institute of Sustainability for Chemicals, Energy and Environment; Daniel Gait Anak Kumbang, Institute of Sustainability for Chemicals, Energy and Environment; Shi Ying Kwek, Pan-United Corporation Ltd; Jia Wang, PUB; Yan Gu, PUB; Azhar Ismail, PUB; Hwee Sin Tan, PUB; Yunita Tan, PUB; Gurdev Singh, PUB

- **Tackling Stakeholder Engagement, Transformation and Social Inclusion of WASH Practices**
  Odwa Ntsika Mtembu, Department of Water and Sanitation

- **Water, Energy, and Environment Circularity**
  Mohammad Alizadehfard, Osmosis Technology & Engineering Company (OSMOTEC)

- **Water as a Catalyst: A Nexus-Based Model for Tribal Empowerment in Rural India**
  Pramod Gaikwad, Social Networking Forum

- **An Innovative Implementation Model to Identify SDG Goal Interlinkages whilst Maximizing Stakeholder Engagement towards Achieving the 2030 Goals**
  Mark Bannister, Department of Water and Sanitation

- **Danish Roadmap Toward Building with Blue Biomass**
  Peter Vangsbo, Arup

- **Restoring Contaminated Aquifers Through Nature-Based Technologies: The Eni Rewind Experience within the EU NYMPHE Project**
  Mauro Barompriori, Eni Rewind; Federico Santoro, Eni Rewind; Maria Alejandra Decima, Eni Rewind; Giulio Zanaroli, University of Bologna; Elena Biagi, University of Bologna; Eliana Musmeci, University of Bologna

- **The Impact of Fishway Collecting System Operation Conditions on *Carassius auratus* Upstream Migration**
  Yiqun Hou, Institute of Hydroecology

- **Gaps in NbS Implementation in SEA, an Ecological Modelling Perspective**
  Zi Yu Cheok, DHI Water & Environment; Naomi Heng Hwee En, DHI Water & Environment; Hui Dayna Su-En, DHI Water & Environment

REGISTRATION & ENQUIRY

REGISTRATION

Pass types and fee structure can be viewed online here before registration.

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.

SPONSORS & PARTNERS

Lee Kuan Yew Water Prize

Presented in partnership with

TEMASEK Foundation

Founding Sponsors

AECOM

aws

Jacobs

Keppel

MEIDEN
Quality connecting the next

nijhuis
Nijhuis Saur Industries BV

RAMBOLL

RSK

TORAY

xylem
Let's Solve Water

ZWEEC
VISION FOR TOMORROW

Thematic Sponsor

ARUP

About Singapore International Water Week

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:
Water Convention Secretariat
Email: waterconvention@siww.com.sg

For enquiries on Singapore International Water Week, please contact:
Email: info@siww.com.sg

ORGANISED BY

Singapore International Water Week Pte Ltd, a subsidiary of PUB, Singapore's National Water Agency.

HELD IN

SUPPORTED BY

IN SUPPORT OF