GLOBAL WATER SUMMIT 2025

ACCELERATING INVESTMENT

12 - 14 May 2025 | Paris, FR

Global Innovations in Wastewater

Divya Sharma

(Water Industry National Environment Programme) WINEP Engagement Manager

Anglian Water

Jayne Beckmann

Process Engineer

New York City Department of Environmental Protection

GWI GLOBAL WATER INTELLIGENCE

Agenda

- Quick introductions - who we are and the utility we represent
- Wastewater innovations by country on the Future Water Leaders Tour: Hong Kong, Shenzhen (China), Singapore, Australia
- How do we ensure successful implementation of these innovations?

FUTURE WATER LEADERS TOUR

Divya Sharma

MSc Environmental Management / BSc Biology

- 2.5 years at Anglian Water
- 7 months as Water Industry National Environment Programme (WINEP) engagement manager
- 2 years on Operational Leadership Programme across water and wastewater
- Career experience in environmental microbiology for industry, agriculture and drinking water quality

ROYAL HOLLOWAY UNIVERSITY OF LONDON

University of Reading

About Anglian Water

Our purpose

is to bring environmental and social prosperity to the region we serve through our commitment to

Love Every Drop.

We are geographically the **largest water and sewerage company** in England and Wales

Serving

7 million

people across the East of England and Hartlepool

We operate and maintain

39,248km

of water mains.

Laid end to end, this is further than a trip to Sydney and back

And we operate and maintain

77,300km

of sewers

Laid end to end this is almost **twice around the earth's circumference**

88% have a meter fitted

We employee around **6,000** people, and work alongside a further **3,000** alliance partners and contractors.

Our AMP8 plan will see us create circa **7,000** new jobs across the region

We pump less water into supply every day now than we did in 1989, despite supplying

26% more properties

Since privatisation in 1989, Anglian Water has invested £16.9 billion improving services in our region.

Jayne Beckmann

MS Chemical Engineering / BS Chemical Engineering

- 6+ years at NYC Department of Environmental Protection
- 4+ years Process Engineering and Optimization
- Experience in Regulatory Compliance, Research and Development, Nutrient Removal and Optimization

About NYC DEP

The New York City Department of Environmental Protection (DEP) is the largest combined water and wastewater utility in the United States, with nearly 6,000 employees and an annual budget of more than $1 billion.

WATER SUPPLY

- Deliver nearly 1 billion gallons of water to 9 million New Yorkers every day and maintain 7,000 miles of water mains
- Protect approximately 2,000 square miles of watershed, including 19 reservoirs and three controlled lakes

WASTEWATER TREATMENT

- Treat almost 1.3 billion gallons of wastewater each day
- Operate and maintain 14 WRRFs, 96 pumping stations, and over 7,500 miles of sewers

AIR, NOISE, AND HAZARDOUS WASTE

- Enforce the NYC Air Pollution Control Code to reduce local emissions, enforce the NYC Noise Code, and regulate hazardous waste

Hong Kong: 3 main themes

1. Diversification use of wastewater – circular economy thinking
2. Sustainable elements of plant design
3. The extensive use of seawater for toilet flushing

1. Diversifying the use of wastewater: circular economy thinking

Environmental impact mitigated by less treated sewage effluent discharged to waterbodies and preserving the use of precious freshwater.

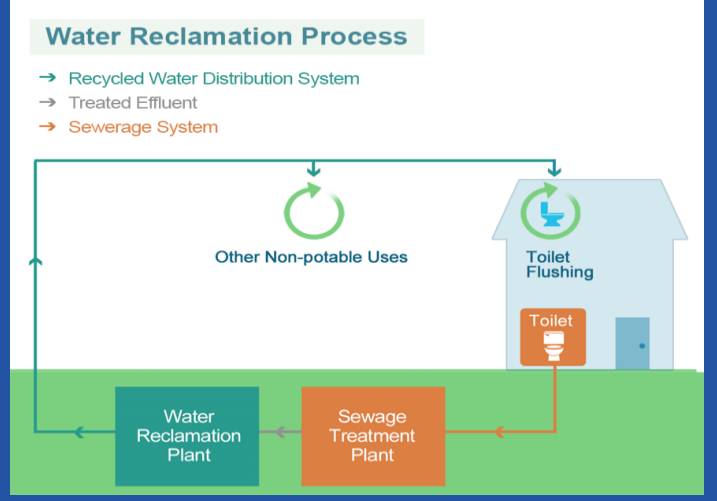
Examples:

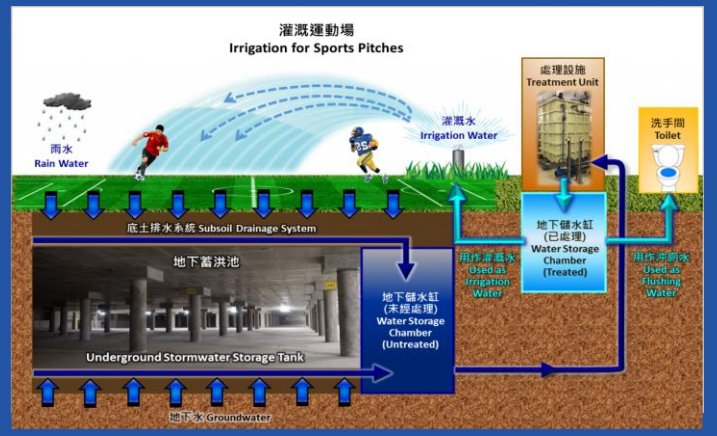
Ngong Ping STW pilot

- Consumes 150m³ of reclaimed water daily. The UV disinfected tertiary-treated effluent is further chlorinated to supply toilet flushing, aquarium fish and irrigation on site.

Happy Valley Underground Stormwater Storage scheme

- Underground stormwater storage capacity of 60,000m³
- The water harvesting system allows groundwater, irrigation water at sport pitches and stormwater to be harvested from subsoil drainage systems built underground.
- After simple disinfection, the reclaimed water is reused for irrigation at 11 football pitches, toilet flushing and supplying for street cleaning.

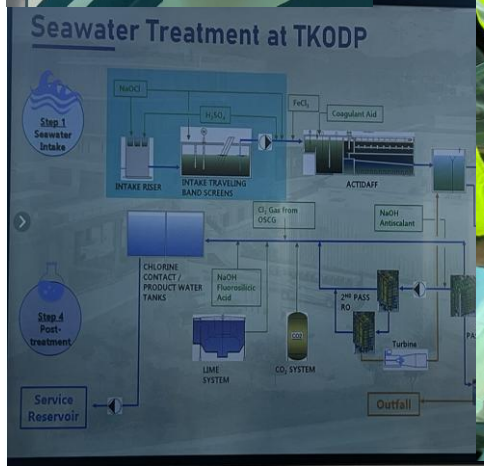




2. Making infrastructure climate-proof

Case Study: Tseung Kwan O desalination plant (TKODP)

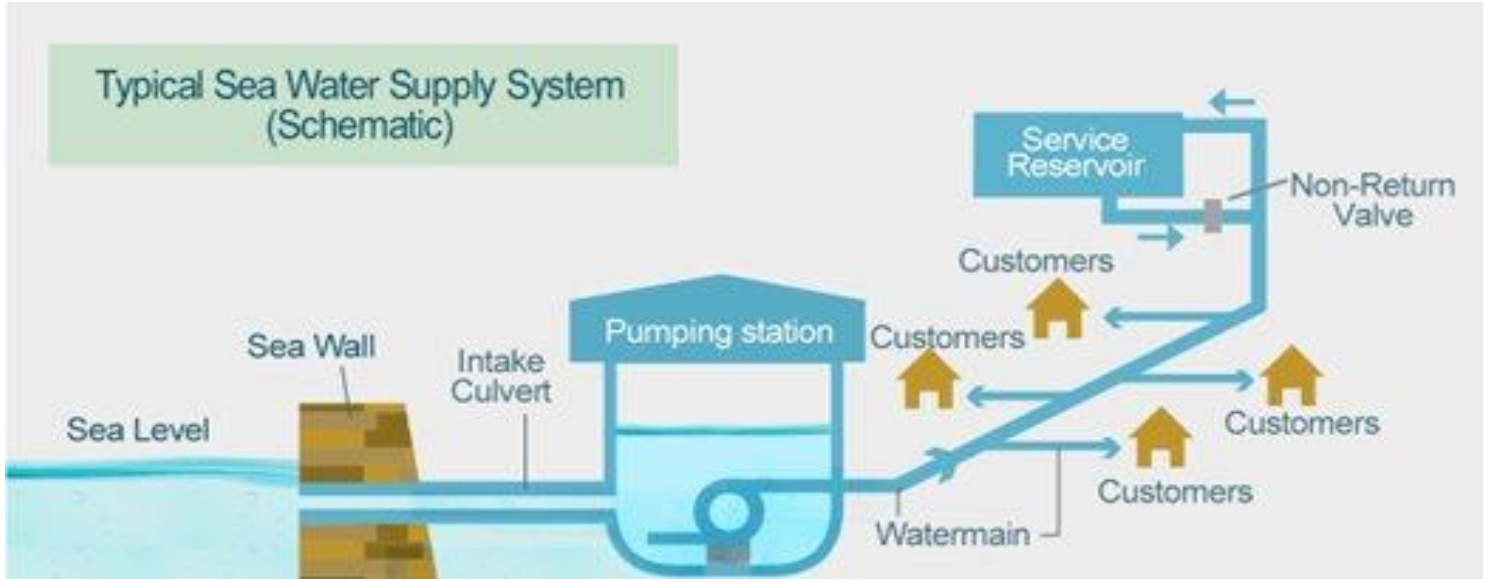
- TKODP achieved the **highest achievable rating for sustainability** as per green building assessment tool ‘BEAM Plus New Buildings’
- ActiDAFF combines flotation & filtration processes to reduce land footprint. **Energy recovery devices** recover up to 96% of the pressure energy from the brine, reducing pumping energy required by up to 50%.
- Two-pass reverse osmosis design sends only **rear end permeate for 2nd pass through reverse osmosis process.**
- Use of **renewable energy** in the treatment facilities (16.2% consumption in building services), introducing **rainwater harvesting for irrigation**, solar **panels** for electricity generation, **smart street lighting** poles, **roof greenery** and **vertical green walls.**
- **Grey water reuse and rainwater harvesting** to reduce freshwater consumption by over 50%
- Future plans of a large scale **10 MW solar farm** to generate electricity.



GLOBAL WATER SUMMIT 2025

3. Seawater for flushing

Hong Kong has used seawater for toilet flushing since the 1950s. It's the **only city in the world with an extensive seawater supply network for toilet flushing** - with 85% coverage as of 2022.



Network: 35 pumping stations/55 service reservoirs in the system – with a storage capacity of ~260,000 m3 and 1600km of seawater pipeline.

Consumption: 320 million m^3(as of 2022) , 31% of the freshwater consumption.

Average cost for flushing: \$4/m^3 compared to \$10/m^3 for freshwater (2.5x costlier)

Future: Exploring the use of 'recycled water' from a centralised water supply system for flushing and other non-potable uses. **From March 2024, recycled water is being supplied for flushing in Sheung Shui and Fanling.**

Shenzhen, China: 3 main themes

1. Using AI technology for the prediction of operational issues to promote proactive maintenance
2. The use of AI technology for the remote control of routine operations tasks reduces workforce demands
3. Seamless integration with the environment – plant design brings wider benefits to the community with public engagement in mind

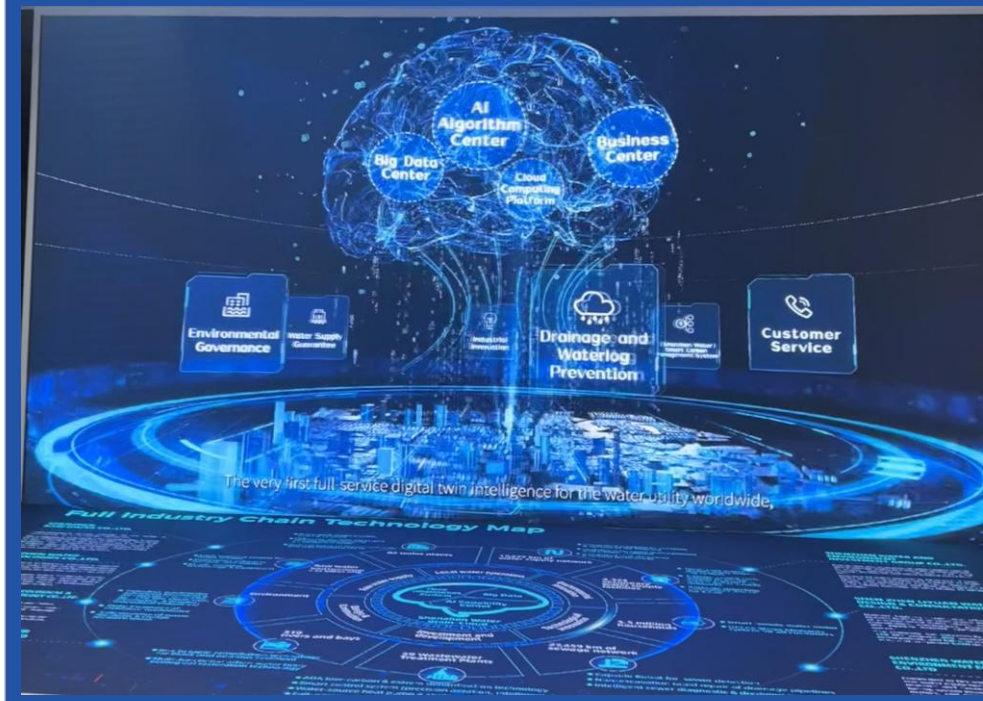
1. Predictive intelligence promotes proactive maintenance and intelligent decision making

Case study: Honghu Wastewater Treatment Plant (WWTP), Shenzhen Water and Environment Group

- Digital twin enables 3D operation of the WWTP using a **data driven model**
- **Integrated SCADA real time data** (pressure, flow, turbidity) plus **sensor information** (vibration, temperature) to **monitor plant performance** and **identify emergency** situations
- Allows for **real time simulation and scenario responses**, so situational **contingency plans** can be made
- **Equipment and process simulations**: virtual disassembly and simulation of complex pipelines/equipment operations are carried out to facilitate equipment maintenance. Predictive maintenance helps achieve equipment life expectancy.

Honghu WWTP:

- Treatment capacity of 50,000 m^3/d and 100,000 m^3/d in phase 1 and long term, respectively.
- Primary treatment method: Membrane Reactor Technology



2. Remote control of operations using AI technology

Case study: Honghu Wastewater Treatment Plant (WWTP)

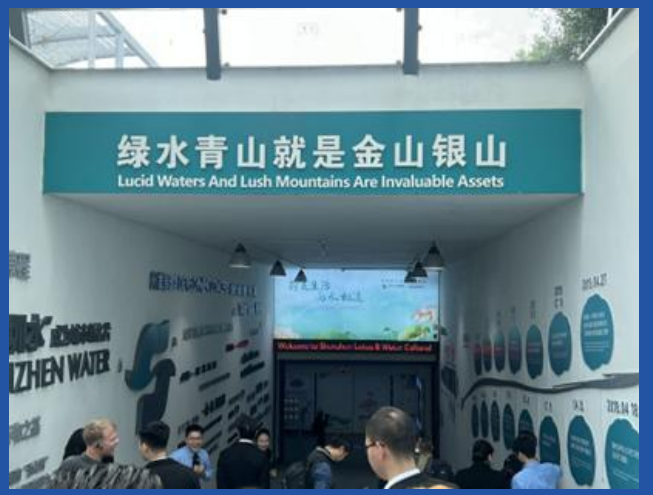
- **The digital twin model** enables 3D operation of the WWTP utilises data from **remote inspections** for **intelligent work order management**
- 'Robodog' patrols the plant conduct **automated inspections**, using infrared technology to scan the environment for potential issues
- **Remote controlled drones** take final effluent samples, which then undergo **automated analysis through robotics**
- '**Smart helmets**' worn by operators which feed live footage to the control room.

3. Integration with the environment brings opportunity for public engagement and education

- Honghu WWTP is built underground and integrated into the lotus-themed landscape of Honghu Park - providing **amenity benefits** to the public through a science exhibition hall

- Comprehensive **underground and overground planning** (approx. land area of 3.24 hectares) enhances the surrounding environmental quality including a ‘recycled water replenishment pond’

- **Odour free technology** along with fully connected **WiFi**, makes the plant accessible to the public – providing education on the wastewater treatment process



Singapore

1. Utilizing Non-Potable Water for Industrial Use. Ability to utilize recycled water for industrial purposes maximizes potable water for domestic use.

2. Alternative Sources of Potable Water. Desalination, indirect potable reuse, and traditional sources of potable water allows for more resiliency of the potable water network.

3. Community Planning. Design of new or coastal facilities are designed and constructed with community input and/or uses in mind.

Keppel Marina East Desalination Facility

Alternative sources:

- Saline and freshwater sources
- Intake determined based on reservoir levels
- 30 MGD/136,000 m^3/d of potable water produced

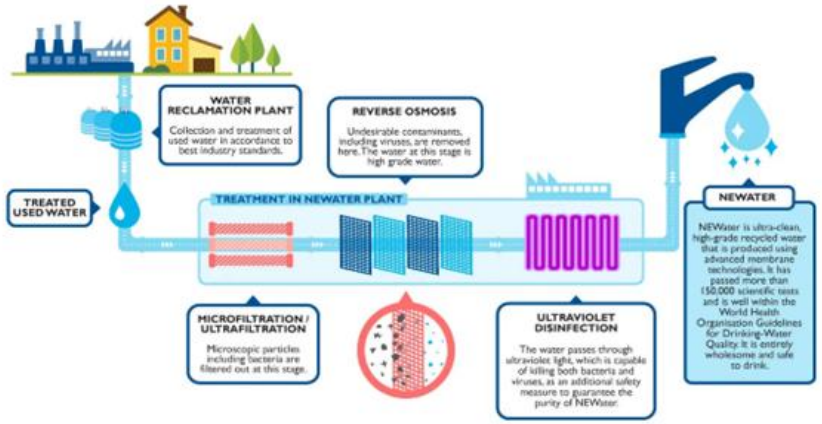
Private/Public Partnerships

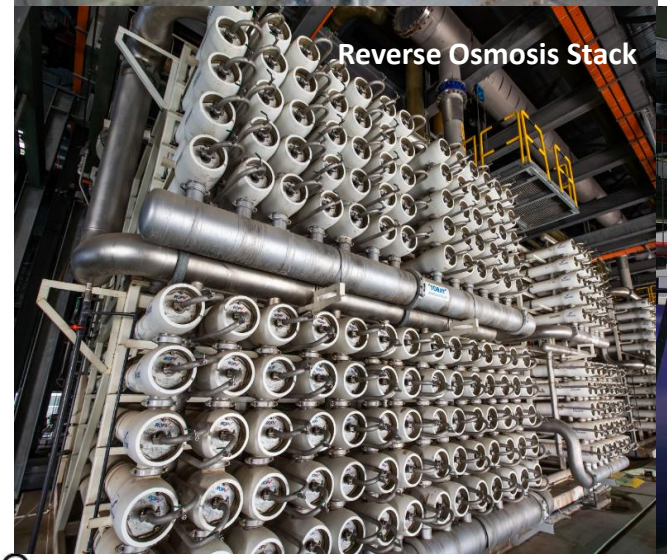
- Design, build, operate

Community Planning:

- Parkland above facility
- Community involvement
- Sustainable stormwater management
- Costal Resiliency

Changi Water Reclamation Plant and NEWater Facility





Treatment Capacity - CWRP

- 920,000 m^3/d (200 MGD)
- Effectively utilize existing footprint
- Able to increase treatment capacity via stacked MBRs
- Class A effluent

Treatment Capacity - NEWater

- 228,000 m^3/d (50 MGD)
- 12% water current demand

Private Public Partnership:

- Built and Operated by third party
- Discharge for industrial and other use

Community Planning:

- Alternative water grid
- Planning for population and industrial growth
- Indirect potable reuse
- Industrial direct use

Australia

1. Circular Economy. Leveraging Private/Public Partnerships to maximize reuse of non-potable water.

2. Ecological Restoration. Regulatory framework allows for best use of revenue for maximum ecological benefit.

3. Digital Innovations. Innovations in Research and Development in conjunction with rollout of digital maps allow for reduction in losses and protecting the environment.

Unity Water


Moodlu Quarry
Wamuran irrigation scheme


Lower Caboolture River Bank Stabilization Project


13.8 hectare irrigation rainforest


3 hectare treatment wetland

Nature Based solutions:

- Wamuran irrigation utilizes approx. 2.6 gigalitres recycled water from Caboolture South WWTP
- Treatment wetland saw 99% TN removal and 99.8% TP removal
- Irrigation rainforest reduced discharge volume to river by 60% providing beneficial reuse
- Oyster and shellfish reefs for nutrient removal in-progress
- Seagrass restoration study to develop metrics for nutrient credits

Ecological Stewardship:

- Irrigation rainforest planted 30+ native species and platypus return
- River Bank Stabilisation project allows for the revegetation of 2.4km of riverbank across 9 sites

Barwon Water


Northern Water Plant


Colac Water Reclamation Plant


CHP at Colac


Hydrogen Power VIVA Energy


Restoration Project

Northern Water/VIVA Energy:

- Private/Public Partnership
- Regulatory Framework
- Green Energy
- Hydrogen Fuel Station
- Oxygen to be sent to WWTP

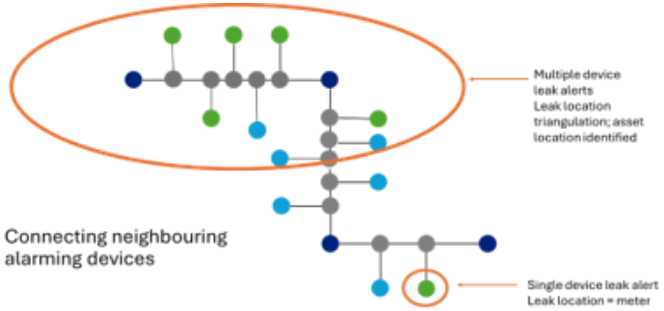
Colac Water reclamation plant:

- Private/Public Partnership
- Organic trade waste to generate RNG
- RNG utilized for green electricity
- Hot water for trade water via pipeline

Ecological Restoration

- Leverage Restoration for nutrient reductions
- Traditional land management where possible

South East Water



Aquarevo:

- 70% reduction in water consumption
- 65% reduction in energy consumption
- Class A recycled water for non-potable use
- Regulatory framework development

Digital innovation:

- Research and Development
- Marketable Products (Sotto)
- Smart Meters
- Saves 1.8 billion litres of potable water
- Saves 30 million litres of recycled water

Recommendations

A circular economy framework is paramount for the successful implementation of new innovations.

1. Working more closely with regulators
2. Public engagement
3. Partnership working outside the traditional water industry
4. Integration with the environment
5. Future skills and development

"Innovation distinguishes between a leader and a follower"

Steve Jobs

Questions?

Reach out to us!

Jayne Beckmann
NYCDEP
jbeckmann@dep.nyc.gov

Divya Sharma
Anglian Water
dsharma5@anglianwater.co.uk