

Water-Wise Cities and Smart Water Systems

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Cost-Effective River Water Quality Management using Integrated Real-Time Control Technology

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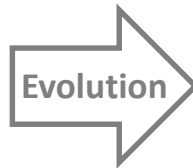
11 Sep, 2018

Cities & Surface Water

City needs (water-related):

- Power
 - Transportation
 - Waste disposal
 - Water & food
- Evolution
- Power
 - Transportation
 - **Waste disposal**
 - **Water & food**
 - **Low carbon**
 - **Resilience**

Traditional
Wastewater
treatment
systems



Smart Wastewater
treatment systems



(Credit: https://springfieldohio.gov/wet-weather-system-overview/wet_weather_flow_graphic/)

To Be Smart

Needs for smarter wastewater systems:

- 1) Waste disposal 2) Water & food 3) Low carbon 4) Resilience

Concepts:

- Waste to resource (1,2)
- Power of nature (1,3)
- Supply \approx demand (1,3)
- Reactive to proactive (1,3,4)

Strategies:

- Resource recovery
- **Flexible and optimal system operation**

Tools:

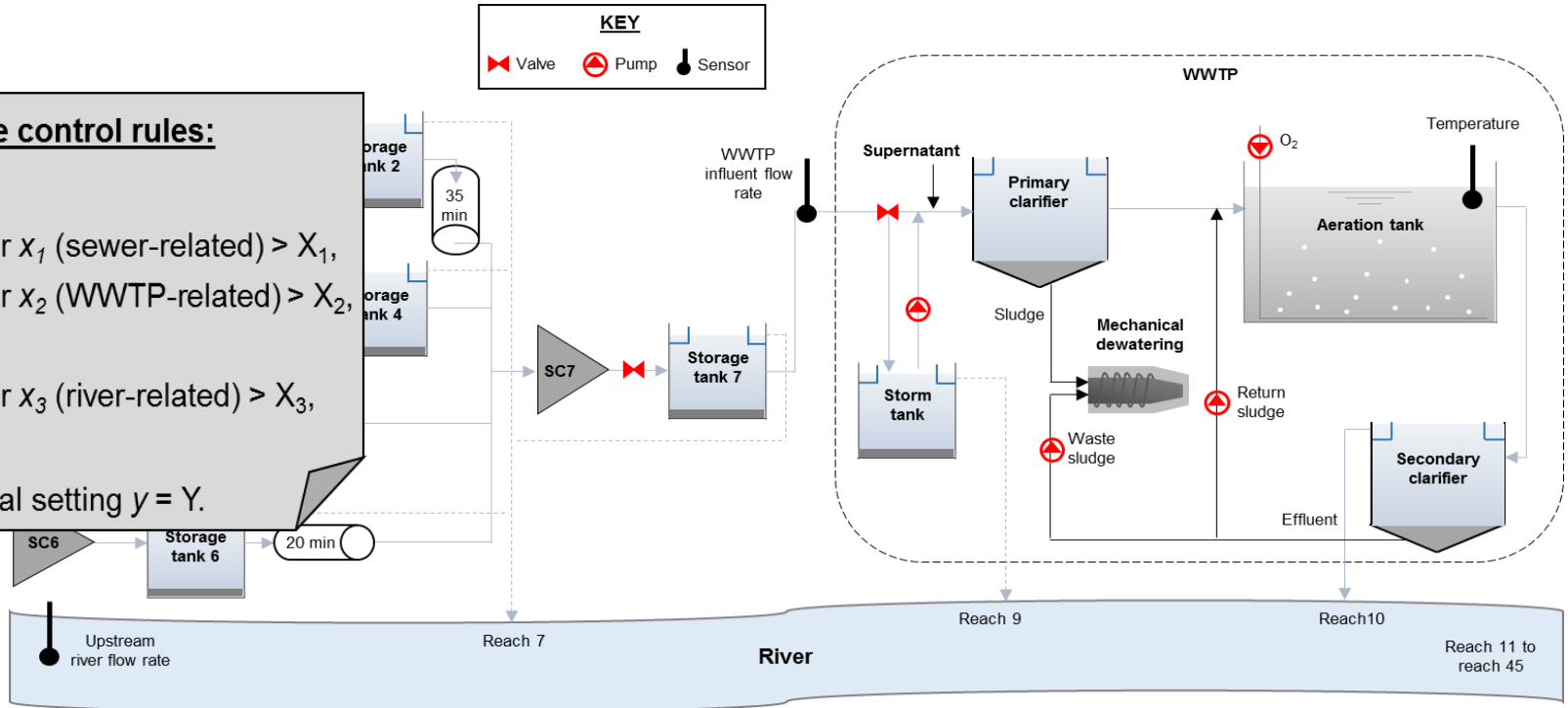
- Mathematical models
- Equipment
- Optimisation

Integrated real-time control (RTC) technology

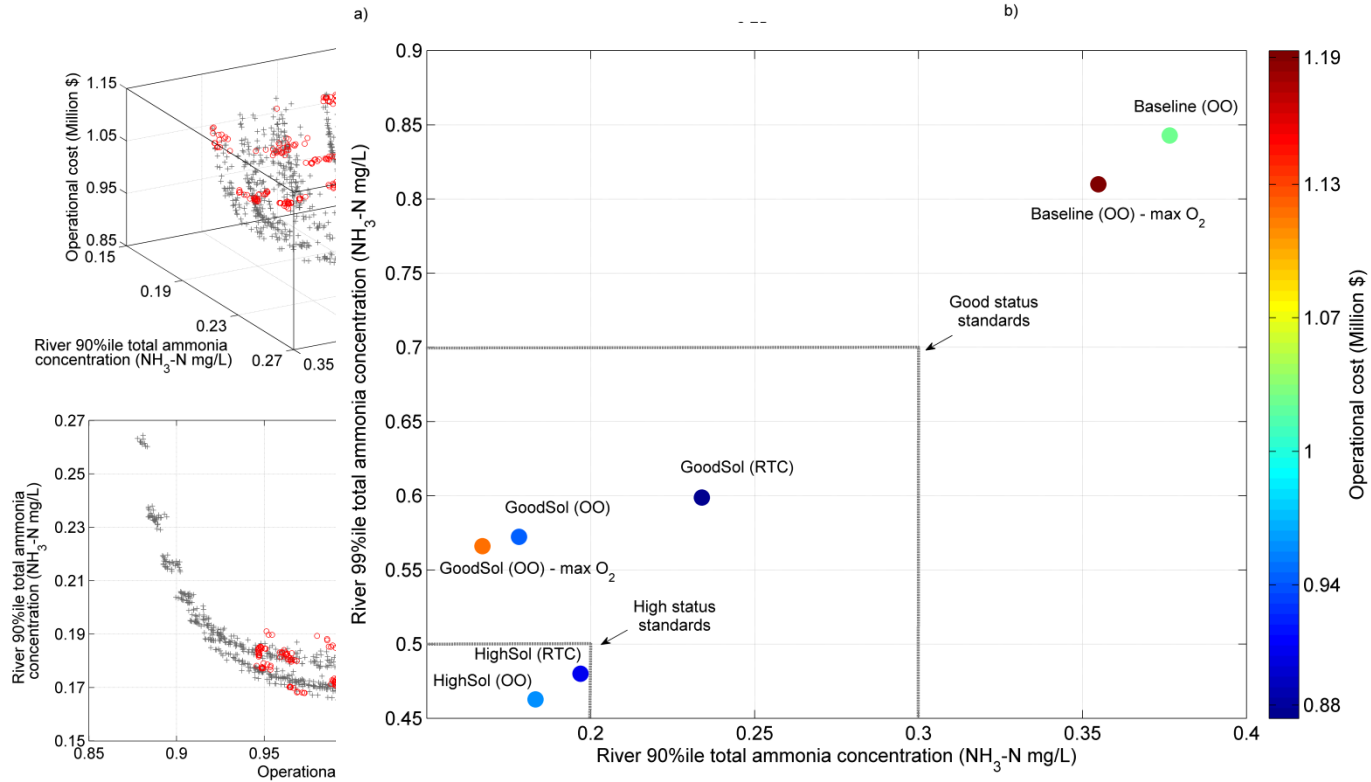
Integrated Real-Time Control

Real-time control rules:

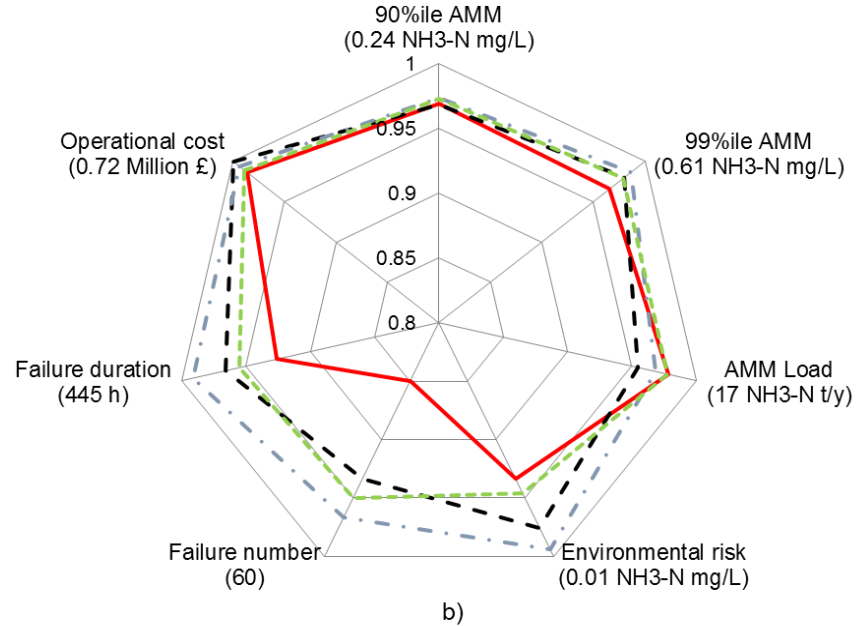
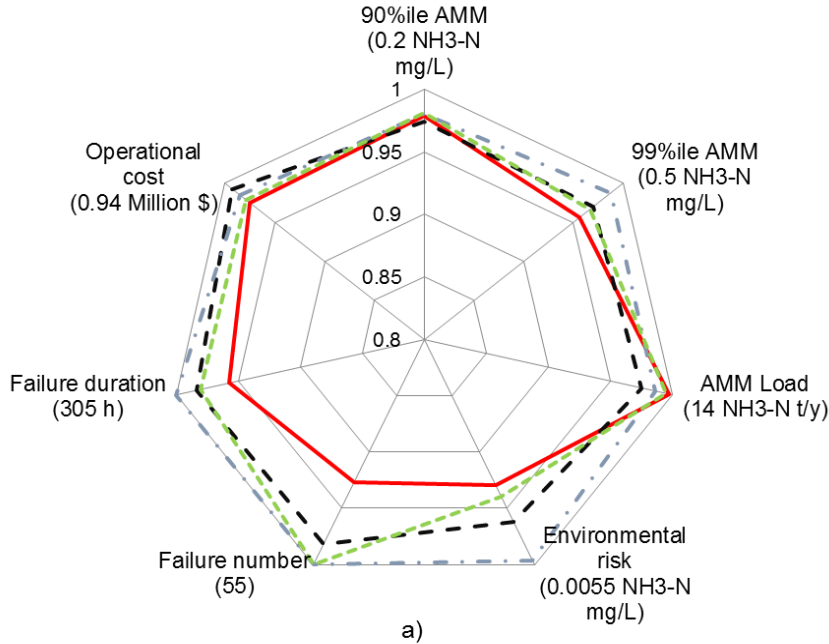
IF
 parameter x_1 (sewer-related) $> X_1$,
 parameter x_2 (WWTP-related) $> X_2$,
 and
 parameter x_3 (river-related) $> X_3$,
THEN
 operational setting $y = Y$.



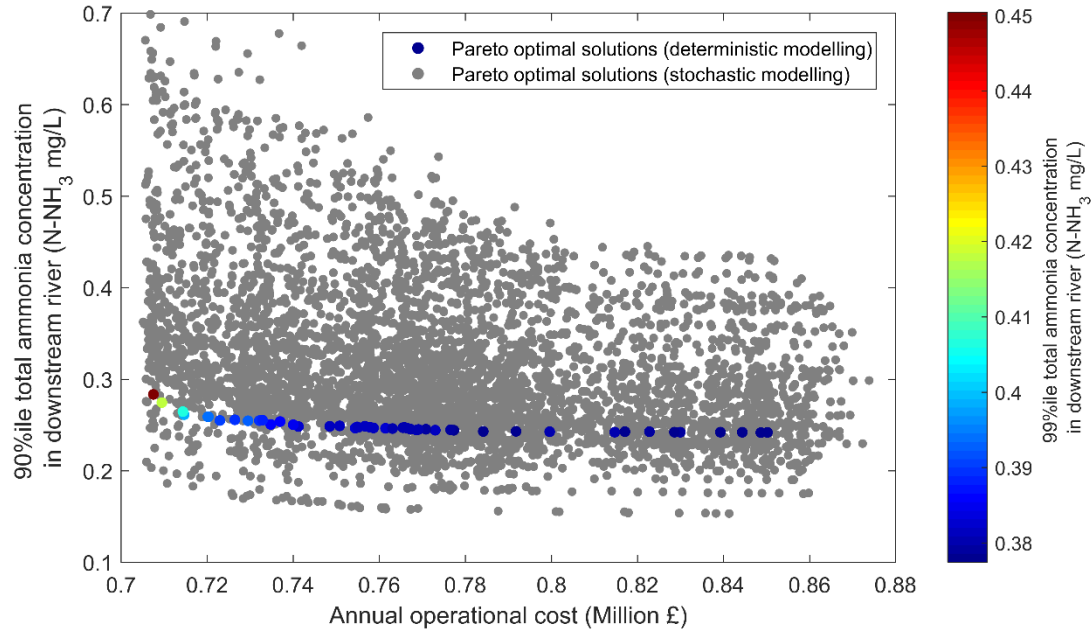
RTC VS Fixed Operation



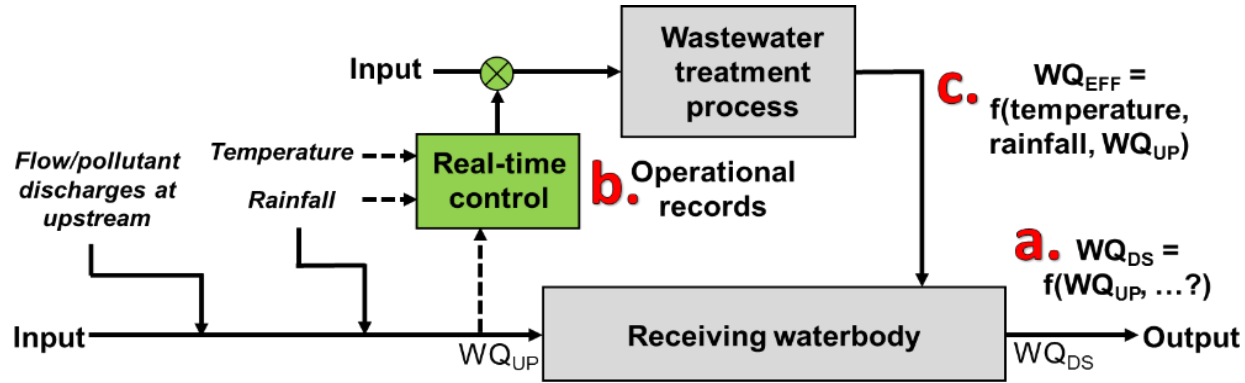
RTC VS Less Flexible Operation



Environment Is Changing...



How to regulate?



Summary

1. Integrated RTC is a promising strategy to:

- ✓ Build smart water systems;
- ✓ Minimise carbon emission without compromising environmental water quality;
- ✓ Enhance system resilience against uncertain future.

2. However, smart permitting policy is needed for its regulation.

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