Digital solutions, empowered with machine learning methods, to optimize water quality management in Singapore catchments

SIWW 2022

19/04/2022

Outline

- Main Challenges
- Solution
- Water Quality Management System
- Key Benefits

Challenges in Surface Water Quality Management

Balance

Recreational use and potable water production

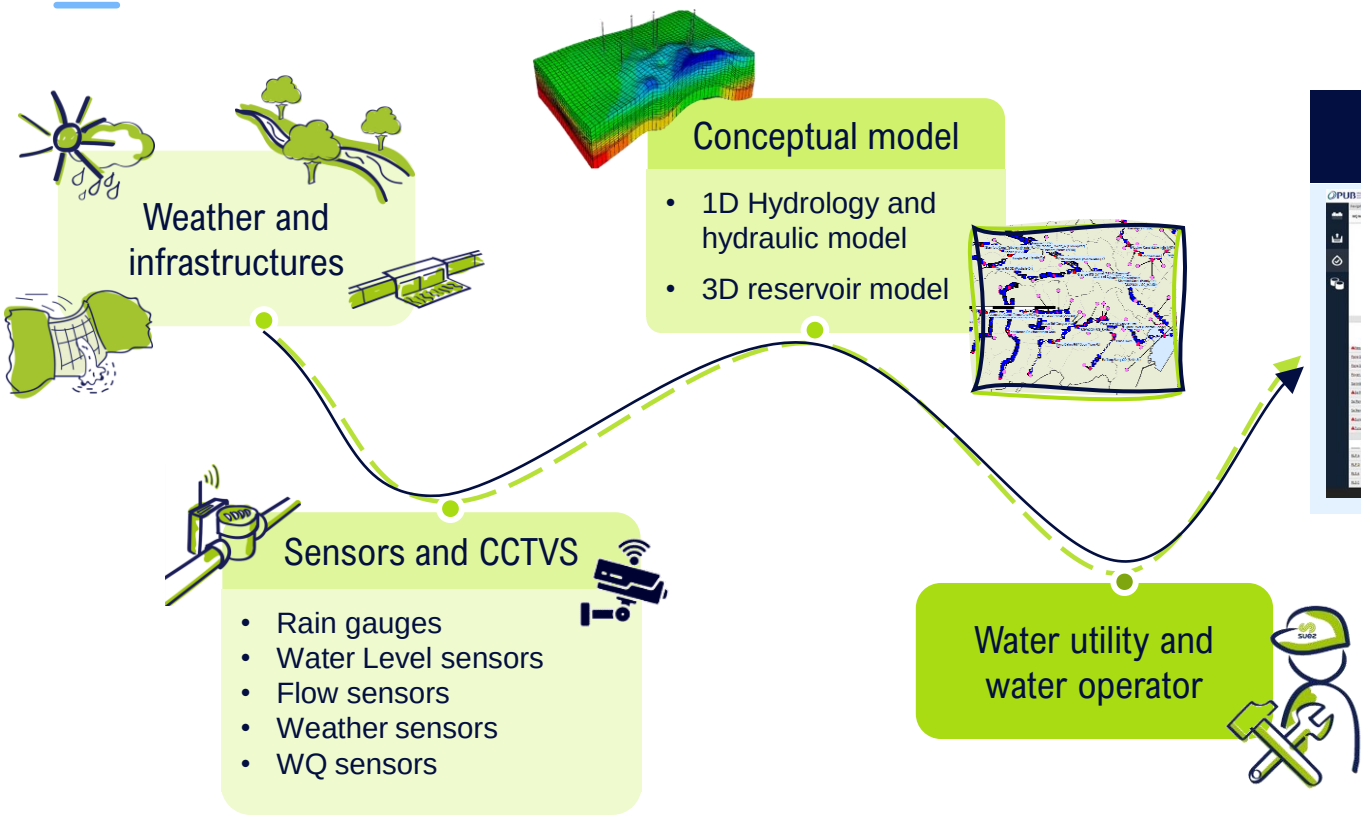
Optimize

Reservoir stock and water quality within the intricate network

Control

Volatility in water quality of urban catchments

Solution – Integrated system



PUB – SUEZ Partnership to develop Catchment and Waterways Operations System (CWOS)

From reactive to prescriptive operations, designed by operators for operators

Powered by AQUADVANCED® Urban Drainage

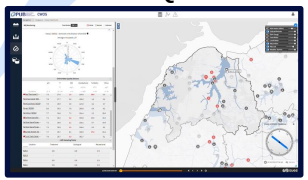
106 Users

1000+ Sensors of various types

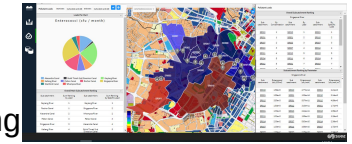
5 Catchment hydraulic models

6 Reservoir 3D Water Quality models

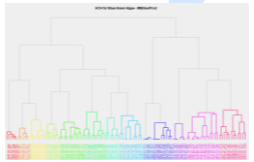
2016
Fundamental WQ monitoring



2019
Customized digital transformation



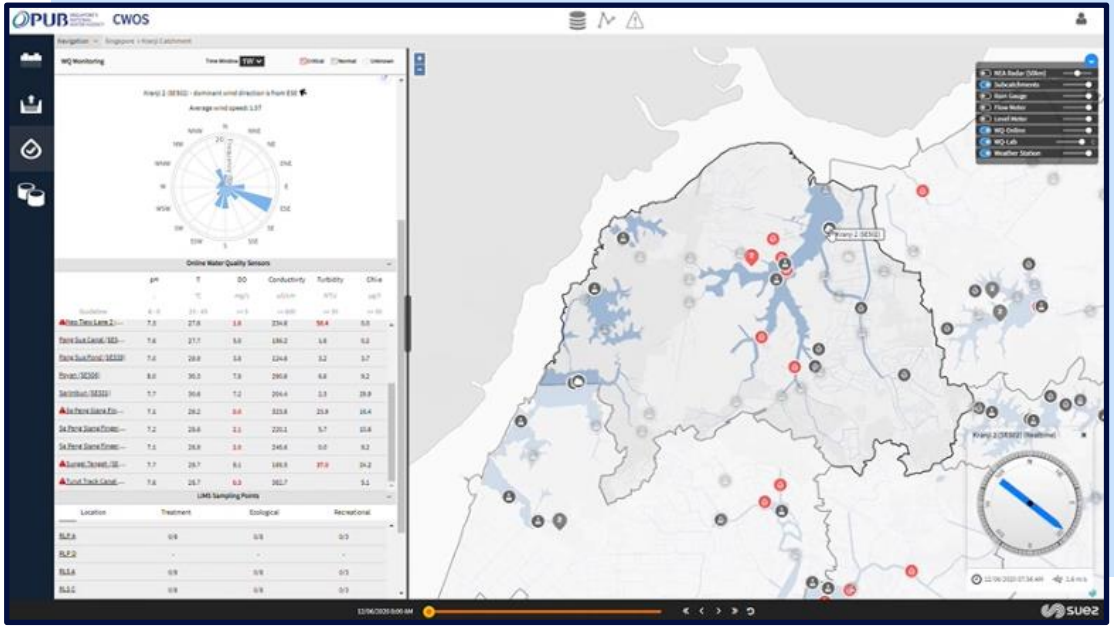
2022
Advanced analytics



Fundamental monitoring system

1 Water quality monitoring

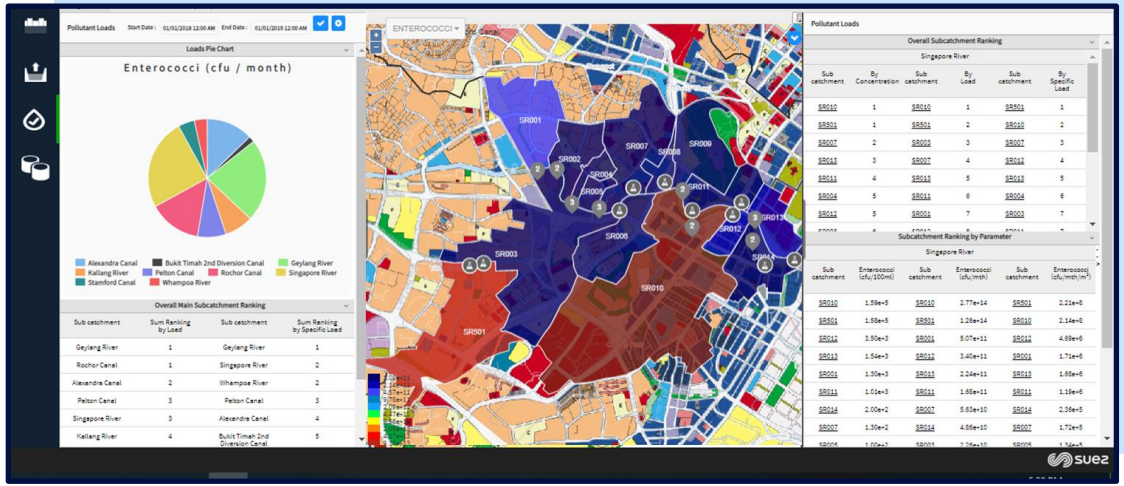
- **Single** dashboard with **all** the information
  - Rain gauge
  - Water Level sensor
  - Flow sensor
  - Weather sensor
  - WQ sensor
  - WQ lab data
- Real-time monitoring and warning about anomalies, which **improves operational efficiency**



Customized digital transformation

2 Nutrient load dashboard

- Facilitate nutrient control planning and management
  - **Automate** nutrient load calculation
  - Visualize results through heat-maps and in a ranked table view
  - Provide a drill-down navigation for **fast assessment**



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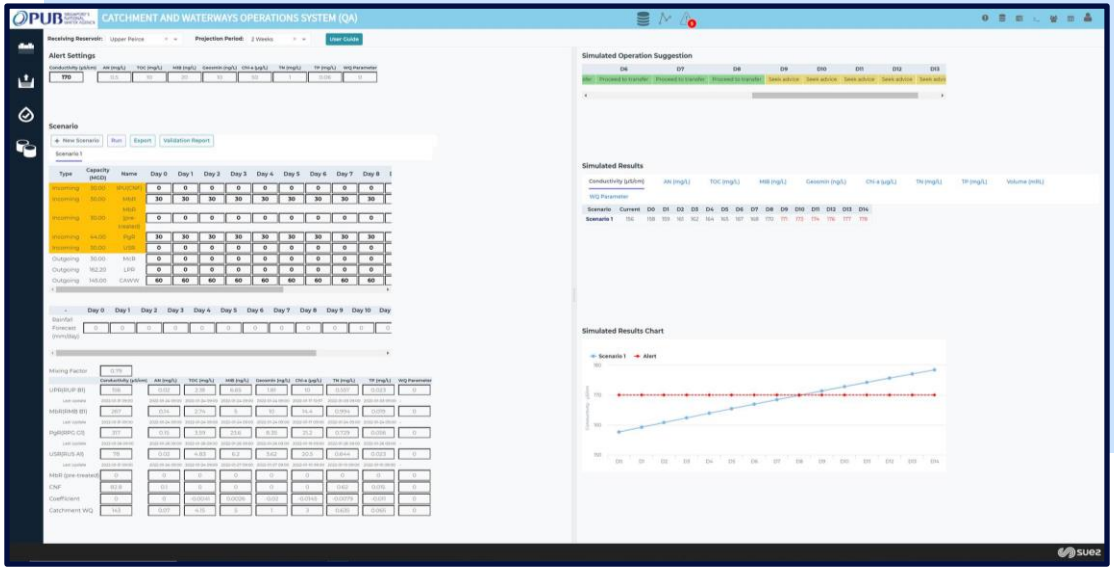
3 Mass balance simulator

- Support operational decision making on reservoir water transfers
  - Model based on mass conservation law, **rapid assessment** by **considering both** water **quantity** and water **quality**
  - Provide **flexibility** to users on defining scenarios
  - Comparison of results for multiple scenarios **at one glance**



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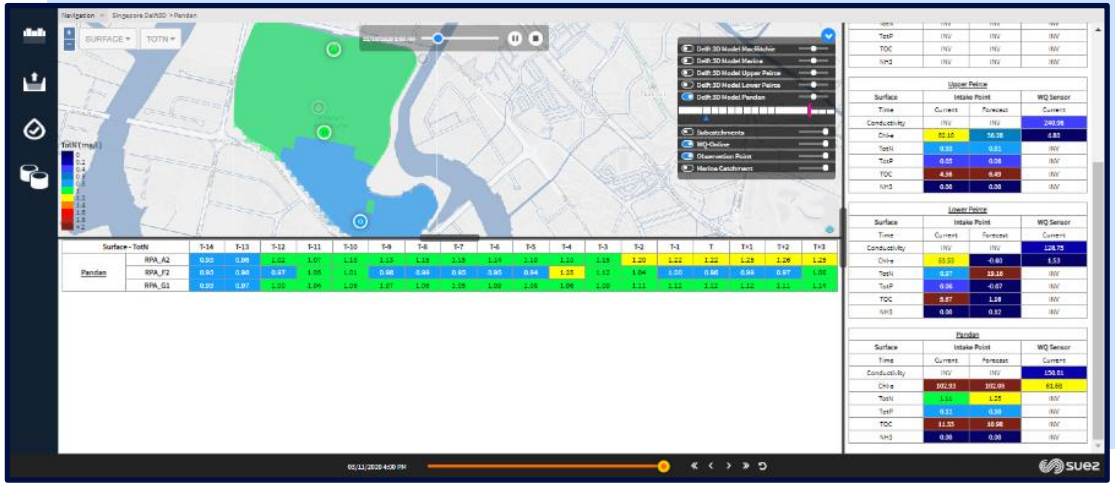
4 Water quality models

- Facilitate mitigation plans ahead using online forecast module
  - Integration of **1D and 3D** models
  - **Automated alarms** via emails when a threshold is exceeded
  - Provide visualization of results by map view and table view

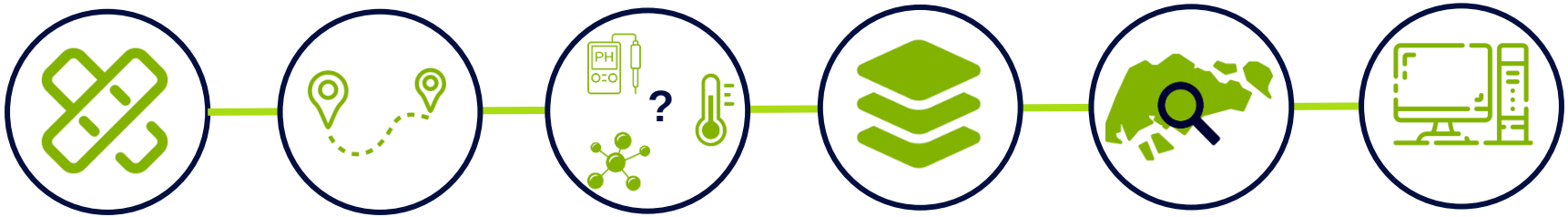


Advanced analytics

Geospatial Mapping and Machine Learning to WQ Sensor Monitoring

Objective: Smarter Alerts and Interpretations

- Explore connections among online sensors (data and geographical information both)
- Incorporate AI into WQ alert advisory to support operations on site



Phase 4

IT integration

What's next ?

What-if scenario display for Water Quality models

More integration with workflows and other systems

Continuous improvement of analytics

Extension of water quality models to all reservoirs

Key benefits

Streamline operations

Data consolidation improves workflows and transparency of processes in catchment and waterways. This facilitates better insights on the ground situation.

Thereby resulting in **more informed decision-making** during operations and improving overall operational efficiency.

Better preparedness

Real-time identification **improves response time;**

Forecasting capabilities enable authorities to **plan** justified, mitigative **measures ahead of time.**

Optimized cost

Automation, strategic use of human resources, advanced data analytics and proactive approach to **resource usage** translate to **cost-savings** in the long run.

Thank you

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