

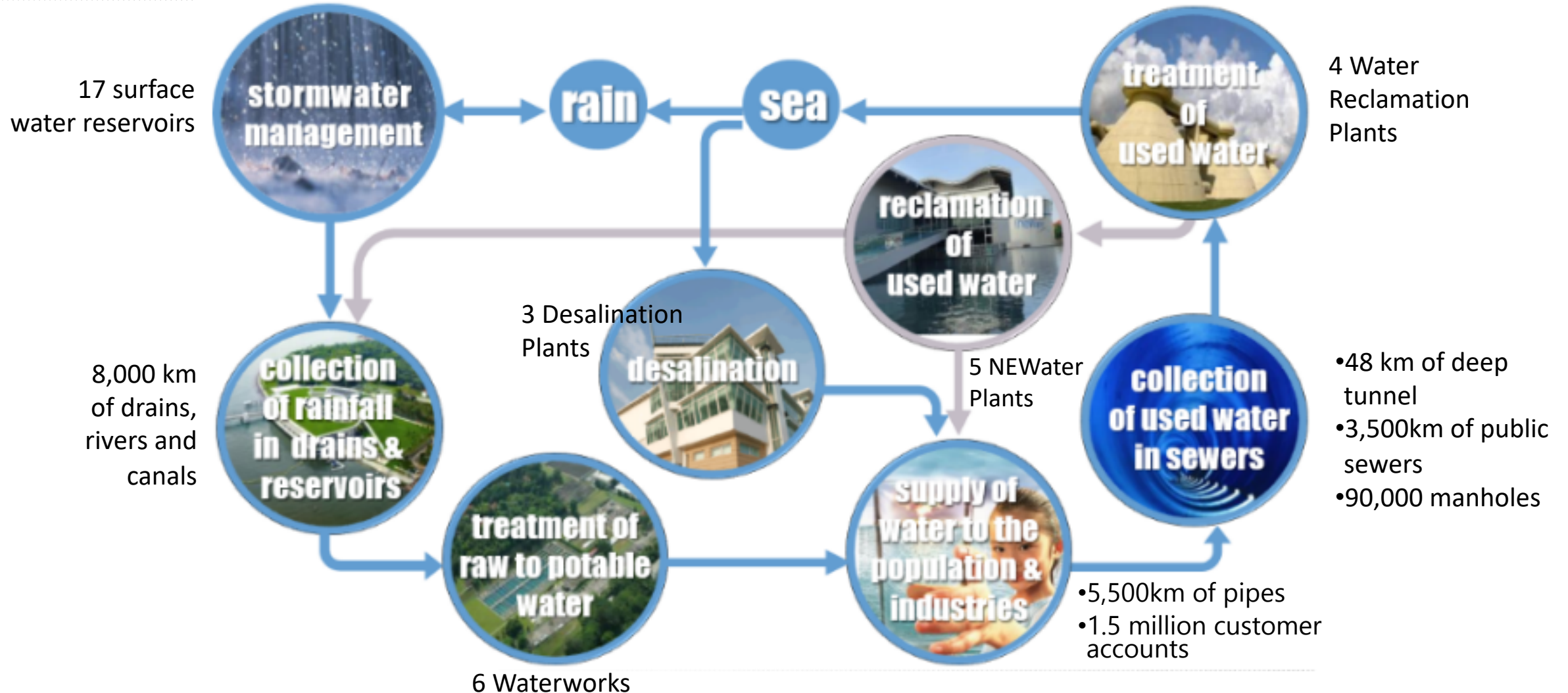
SMART WATER MANAGEMENT – THE SINGAPORE'S EXPERIENCE



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PUB, SINGAPORE'S NATIONAL WATER AGENCY

OUR MISSION – Supply Good Water, Reclaim Used Water, Tame Stormwater







THE NEED TO TRANSFORM

FUTURE-PROOFING THE WATER SUPPLY FOR SINGAPORE



DRIVERS

Increasing Water Demand 	Rising Costs 	Aging Workforce 	Higher Public Expectations 
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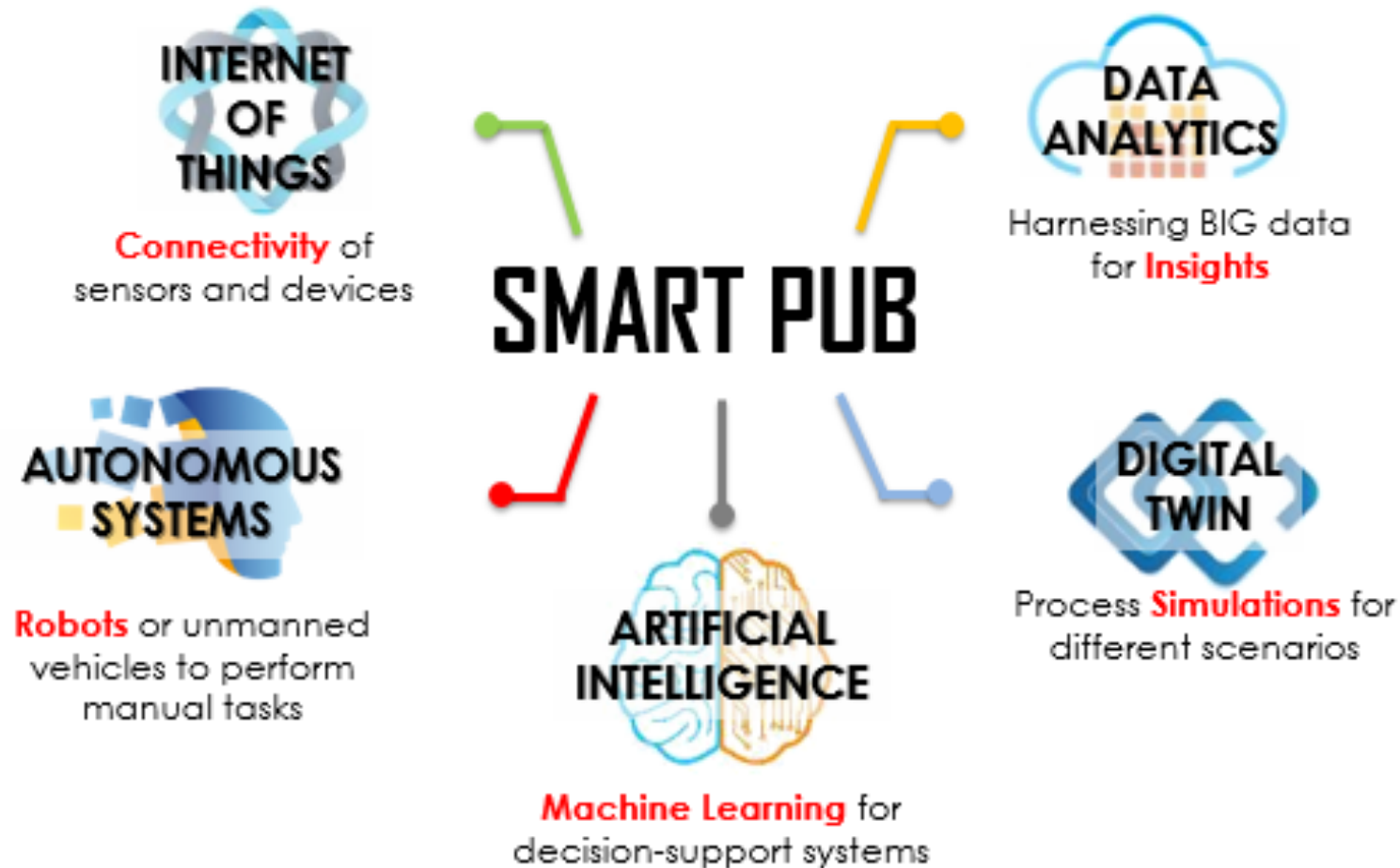
RISKS OF NOT INNOVATING

Vulnerability to Cyber Threats 	Technological Obsolescence 	Lack of long-range solutions to meet future challenges 	Inefficiencies and Wastage 
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SMART TECHNOLOGIES. SMART PUB.

FOCUS ON 5 TECHNOLOGY ENABLERS

The SMART PUB Roadmap is a 5-year plan to deploy 5 identified tech enablers across PUB and across the entire value chain from planning to operations & maintenance



DESIRED OUTCOMES

- Delivering our Mission
- Operational excellence with a leaner workforce
- Enhanced system oversight and situational awareness with data-driven decision support
- Improved service delivery
- Enhanced safety and security

EXPLORING POTENTIAL APPLICATIONS ACROSS PUB

Catchment and Waterways

Water Supply Plants

Water Supply Network

Water Reclamation Network

Water Reclamation Plants

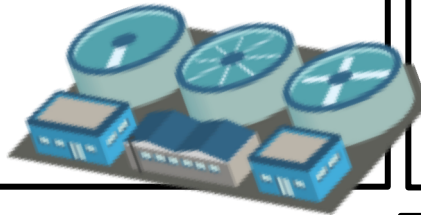
SMART DRAINAGE GRID

- Extensive hydrometeorological monitoring
- **Predictive** drainage and flood management
- Analysed data to support **strategic planning** and **maintenance of drainage infrastructure**



SMART PLANTS

- **Optimised operations and decision support**
- **Man-less** operations with automation
- **Autonomous security and safety** surveillance



SMART WATER GRID

- Extensive monitoring of network pressure, flow and water quality
- **Pre-emptive** leak detection
- **Predictive load dispatch:** Demand forecasting via machine learning



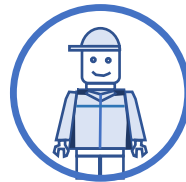
SMART SEWER GRID

- **Pre-emptive asset repair** and replacement
- **Monitoring** network and tunnel structural integrity
- **Illegal discharge tracing** and modelling



OPS SUPPORT

- 360° **situational awareness** and **system oversight** with improved ops dashboards and mobile connectivity
- **Reducing wastage and enhancing resilience** with data analytics



DIGITAL WORKPLACE

- Enhancing productivity by **automating manual workflows**
- Encouraging **collaboration and knowledge sharing** through digital platforms
- **Improving service delivery** via digital platforms



DEVELOPING SOLUTIONS FOR EACH BUSINESS FUNCTION

SMART PLANTS

OPERATIONS EFFICIENCY

- More **extensive data capture** by sensors & robots
- **Enhanced analytics** using machine learning & AI, **enabling prescriptive & predictive decision support systems** to facilitate operations & maintenance
- **Automation** using robots (e.g. sample collection, surveillance)
- Augmented reality & IoT platforms for **improved data retrieval & reporting**
- **Wireless Sensing**



Smart Technologies currently being piloted

SAFETY & SECURITY

- Surveillance robots & drones
- CCTVs with video analytics
- Wearables with indoor & outdoor positioning



Operations Dashboard



Surveillance Robot Trial

DEVELOPING SOLUTIONS FOR EACH BUSINESS FUNCTION

SMART NETWORKS

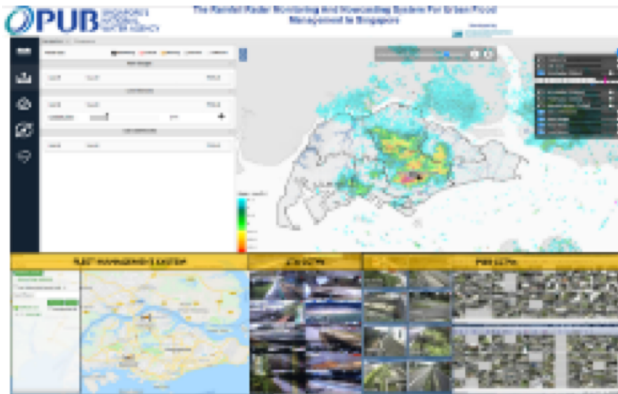
SMART WATER GRID



- >300 sensor stations installed island-wide (water quality, pressure & flow) on PW pipelines
- >100 additional sensors on NEWater, Industrial Water, Potable Water networks



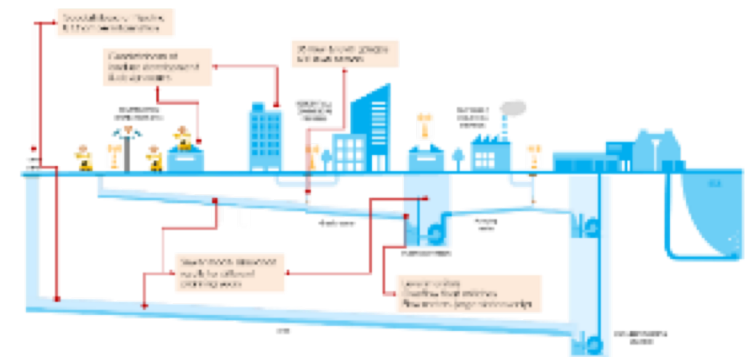
SMART DRAINAGE GRID



- ~600 flow & water level sensors & CCTVs installed
- > 200 additional sensors & CCTVs to be installed



SMART SEWER GRID



- ~700 level, flow, water quality (MES, VOC) sensors installed islandwide
- ~60 additional VOC sensors
- ~100 additional MES sensors

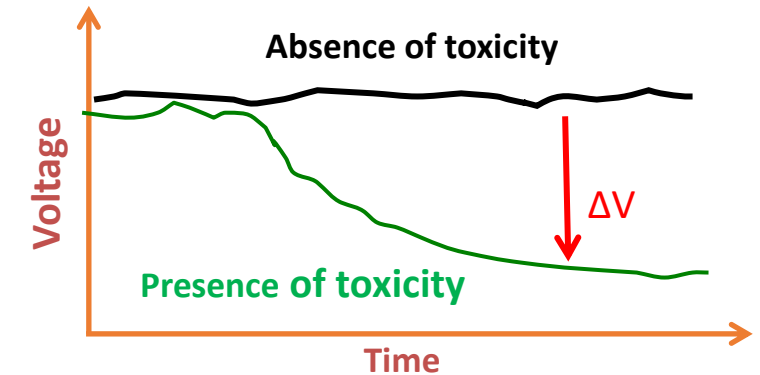
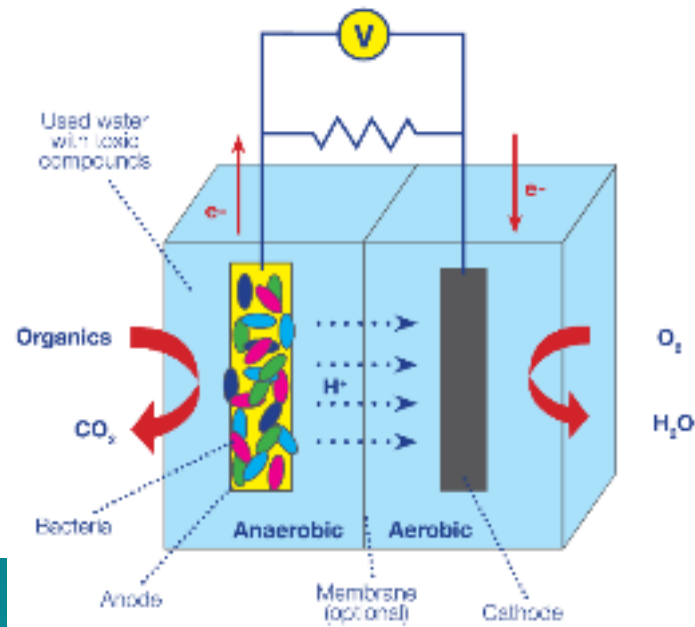


Case Study: Reducing Illegal Discharges

Detect heavy metal toxicity in used water to reduce illegal discharges

EnvironSens

- 8-year development from proof-of-concept with NUS to field trials at PUB.
- Mass deployment of 100 units at industrial premises carried out by EnvironSens Pte Ltd, a spin-off company.
- 12 cases of illegal discharges successfully detected that led to prosecution.



Case Study: Remote Sensing of Water Quality

Using Remote Sensing Method to measure water quality real-time

- Early warning of algae bloom in reservoir water
- Hyper-Spectral Imaging (HSI) technology , developed locally by **Nexusbit**, that captures ground images of open water bodies and compare the water-leaving reflectance to measure parameters like Chlorophyll-A and Turbidity
- Enables area mapping of water quality without limitation, like satellite imaging methods (e.g. satellite revisit interval, and require low effort in maintenance.



- Deploy via Smart Beyond Visual Line of Sight (BVLOS) Drones in 2021

Case Study: Inspection of Deep Tunnel System

Unmanned aerial vehicle (UAV) equipped with cameras, sensors, fully automated navigation in GPS-less environments, and AI-based object detection for inspection of deep tunnel system with zero human intervention.

Unique Selling Points

- 360 degree 4K UHD camera- Provides all around footage
- Real time footage and telemetry- Live feed transmitted to the ground
- 25 minutes flight endurance- At 2ms/ flight speed for 2km

Customer Benefits

- Provides all around live footage in the most remote places no human can venture safely into.
- Easy deployment into the desired flight space without any human or equipment insertion.



Nurturing Innovation: Singapore Water Exchange

The Singapore Water Exchange is a dedicated space to further the growth of a vibrant water industry in Singapore. It houses a dynamic ecosystem of water-related companies to leverage mutual strengths and potential synergies to push the frontiers of water innovation and business growth



Commercialisation Ecosystem



Our Water Companies



Create Mindshare: Singapore International Water Week



SINGAPORE INTERNATIONAL WATER WEEK 2021

20 – 24 June 2021
Sands Expo & Convention Centre
Marina Bay Sands, Singapore

500
Water
Leaders

110
Regions/
Countries

> 24K
Participants

S\$23B
Business
Announcements

Stay connected with us:



Statistics are based on the Singapore International Water Week (SIWW) 2018

Upcoming

SINGAPORE INTERNATIONAL WATER WEEK

ONLINE

18 – 19 November 2020
9:00am – 6:30pm SGT (GMT +8)



Thank You!





Thank you!

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