Isle Utilities

15 Top Emerging Technologies in the Digital Water Space

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ABOUT ISLE

WHO WE ARE

Isle Utilities (Isle) was founded in 2010 as an **independent technology and innovation consultancy** with a specific focus to accelerate innovation in the water sector.

WHAT WE DO

Isle supports over **200 water utilities and industrial end users** to **drive innovation**, by implementing innovation strategies and identifying, **evaluating and adopting emerging technologies** and **innovative best practices** in the most cost-effective ways.

GLOBAL NETWORK

Global network of 250 + water utilities, municipalities and industrial companies

INNOVATION IS WHAT WE DO!

Experience in identifying and assessing novel technology solutions as well as qualifying and quantifying market opportunities.

SKILLED TEAM

Highly skilled team of scientists and engineers with experience across water and wastewater.

RESEARCH CREDENTIALS

Experience in researching topics across the globe to determine regulatory, policy, technology and social aspects

COLLABORATION FACILITATORS

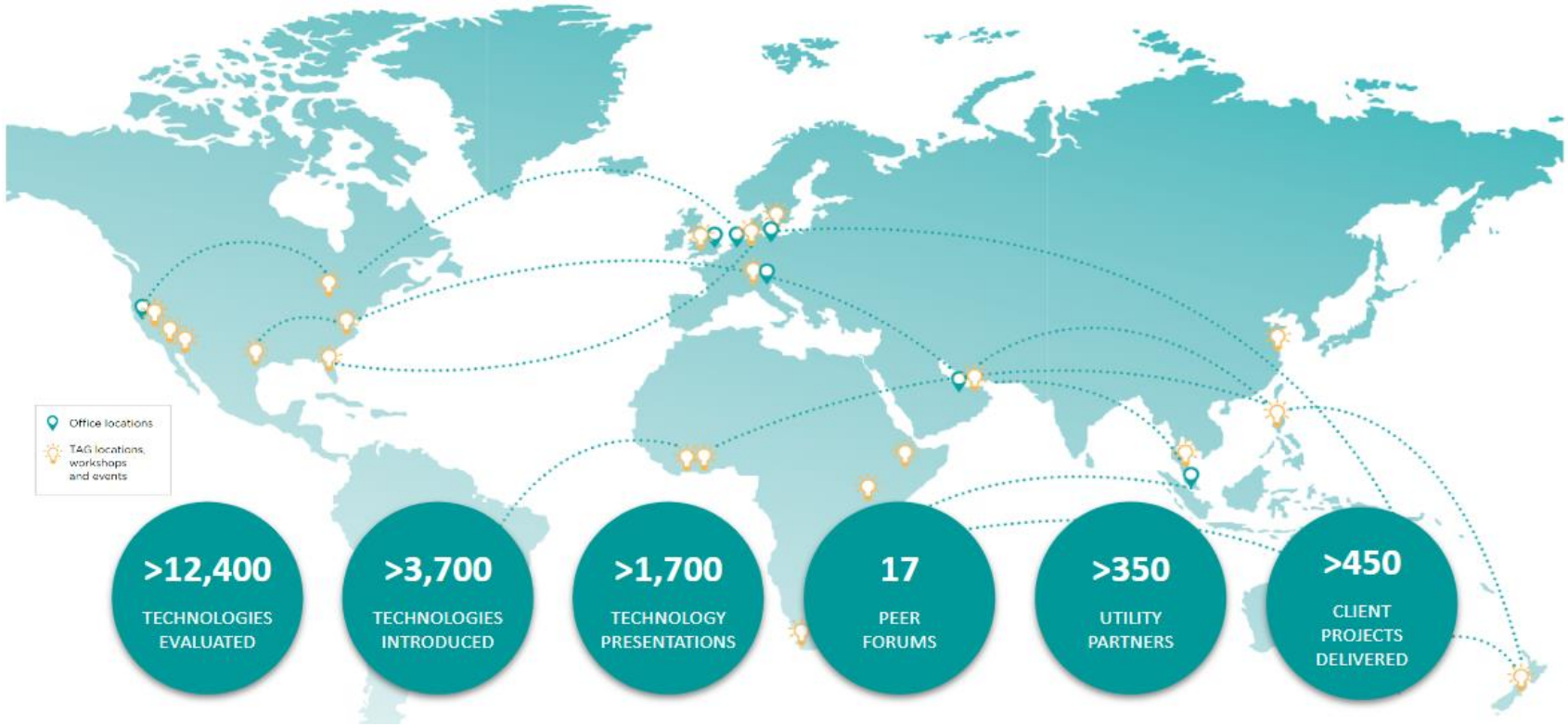
Experience in bringing together organisations with shared challenges to discuss and share experience

YOUR INNOVATION PARTNER

TEAM

Isle is a **global business** with offices in the USA, Australia, Singapore, Abu Dhabi, Netherlands, Italy, Germany, Philippines, South Africa and the UK.
Highly skilled team of over 100 engineers and scientists working around the world with **high technical capabilities and extensive experience of assessing markets and business plans**.

WE BRING TECHNOLOGIES TO LIFE



Identifying Challenges

We collaborate with the world's leading utilities and technology end users. After establishing their challenges, we find solutions through the independent sourcing of innovative technologies.

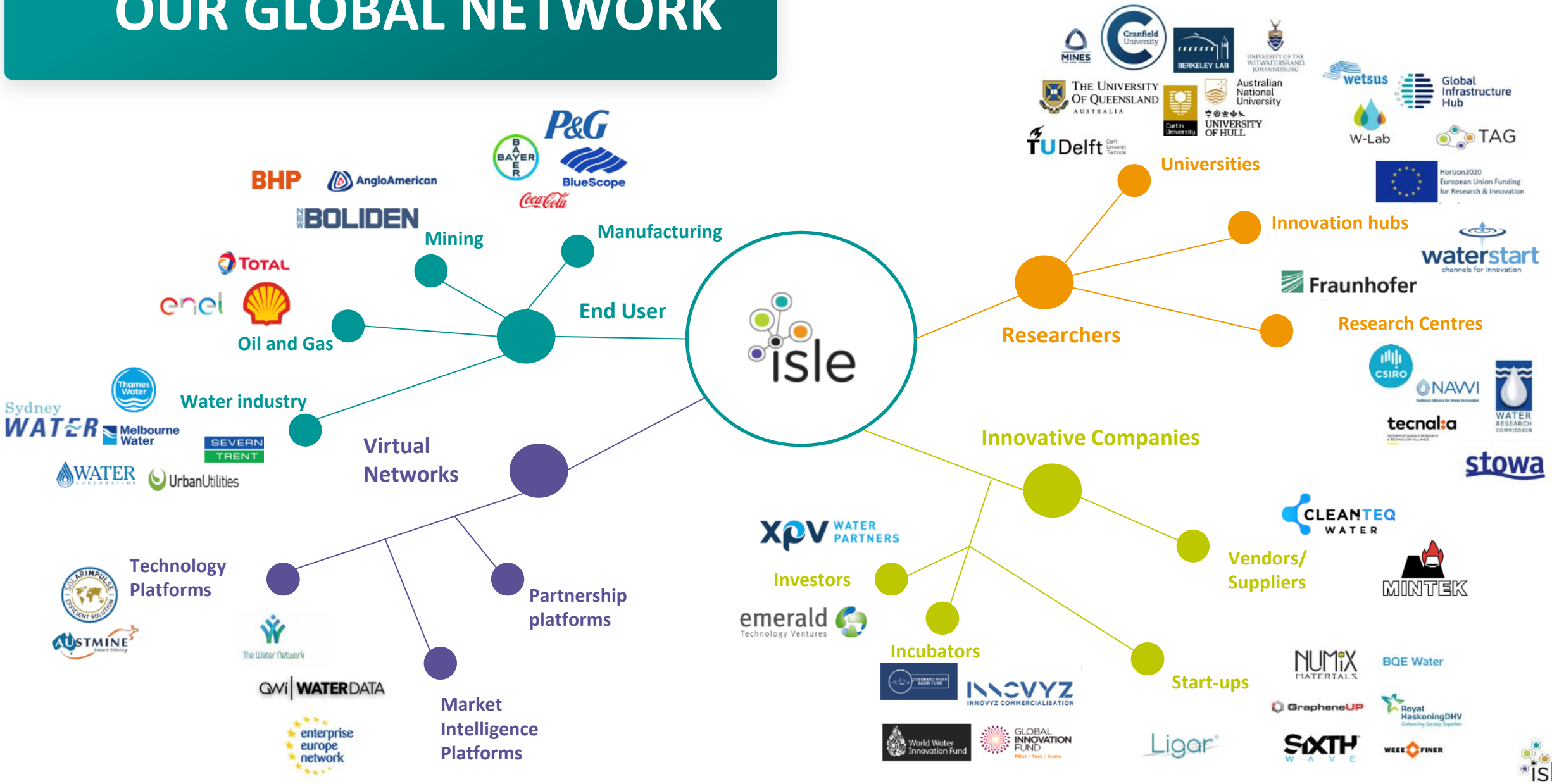
Connecting Technologies

We provide market intelligence to technology providers, enhancing the commercialisation process through increased dialogue and understanding of prospective clients' needs.

Collaborative Evaluation

Our innovation forums collaboratively review emerging technologies in a peer-to-peer environment increasing opportunities for knowledge transfer and shared resources to support the uptake of technology.

OUR GLOBAL NETWORK



Isle’s Technology Due Diligence

Dealflow – Isle's Technology Pipeline

Dedicated water-sector technology scouting, continuously screening new innovations and solutions.

Isle's consultants and experts conduct due diligence assessments
before they are brought to clients via our various services and platforms.

8

scouts

continuously screening new leads for technologies to be assessed

15

consultants

providing over 30 hours of technology assessments per week

4,263

assessments

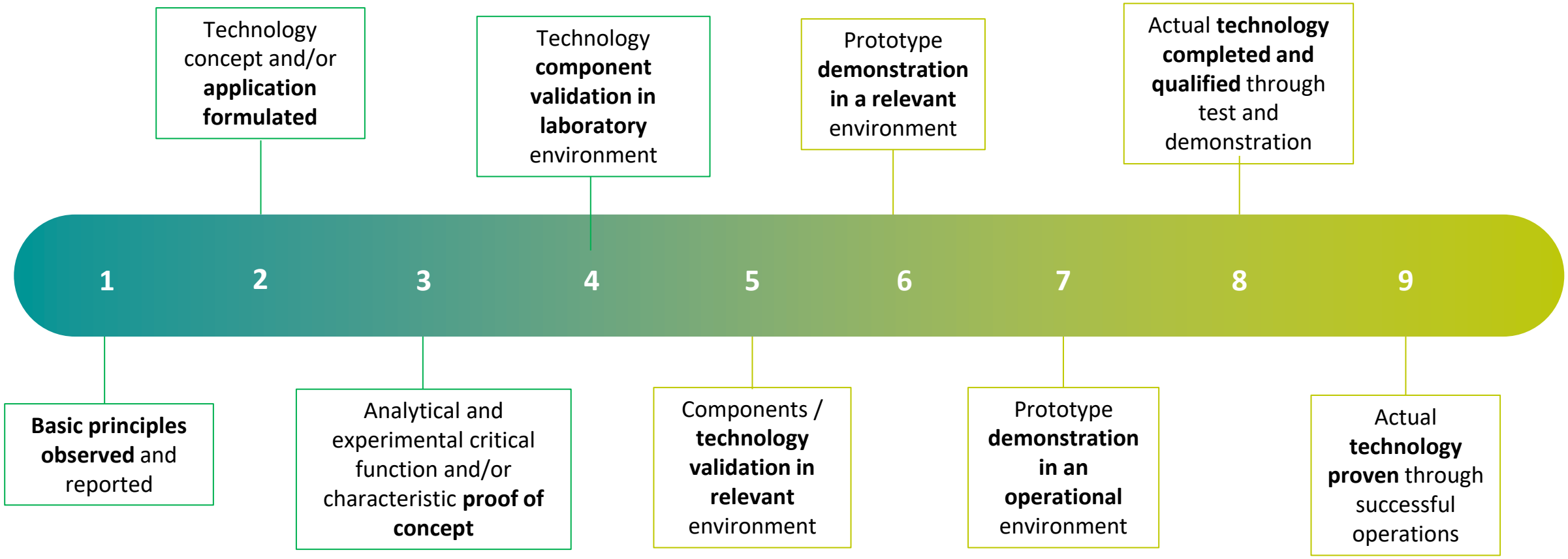
of unique technologies by consultants and specialists to date

1,634

technologies

presented to Isle clients and accessible to our network

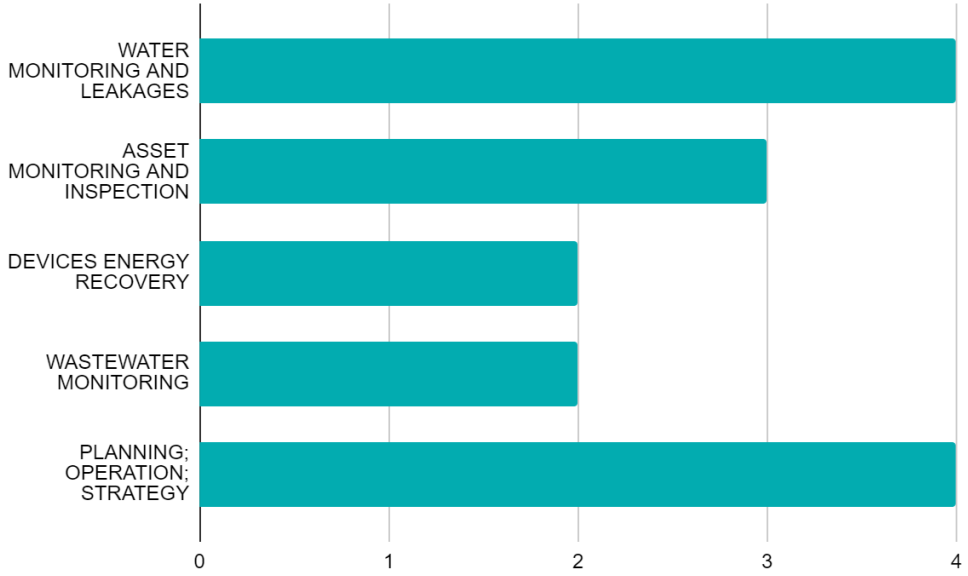
Technology Readiness Level (TRL)



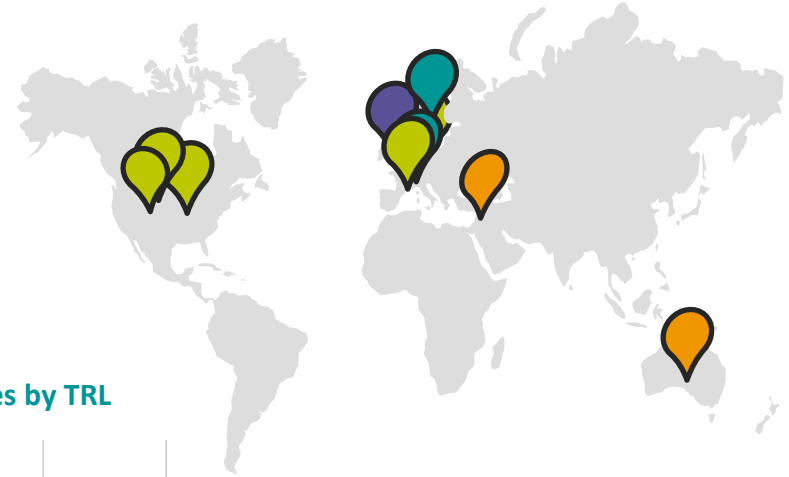
SUMMARY DASHBOARD

15

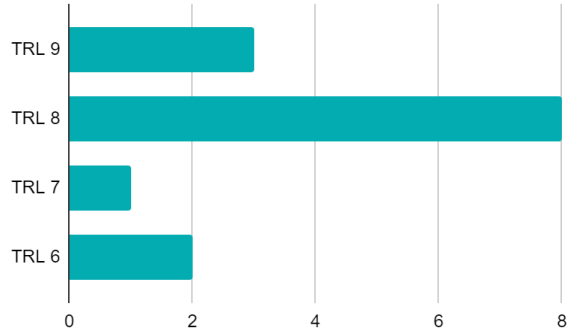
Technologies by Category



Global Distribution of Technologies



Technologies by TRL



Water Monitoring and Leakages

#Clean water
Treatment
Biological
Catchment Management

iolight

Portable Microscope

Digital field microscope with AI capabilities for the instant diagnosis of harmful algal blooms

Easy to use portable microscope . Displays images of single-cell organisms such as algae and diatoms in 3.94 x 10^{-5} in resolution, equivalent to x400 magnification on a compound microscope.

2 drops of the sample . The captured image is saved in the device's photo gallery and is either shared with an expert for verification or uploaded to the AI image application for rapid diagnosis (10 minutes)

Easy to use portable microscope, with a resolution of 1µm.
It can display images directly onto a tablet or mobile phone

It can be used for catchment management. Identify the presence of HABs in source water, distinguishing them from beneficial algae.

#Network
#Clean water
#Sensors and monitoring
#Physiochemical

SALAMANDER GROUP

DBPClam

Battery-powered, disinfection-by-product sensor that provides real-time monitoring for network-wide deployment

Flow cell and sensor package (6-cm diameter x 25-cm length) that detects disinfection-by products (DBP) such as trihalomethanes down to µg/L levels through a photoionisation detector

Sensor output is an aggregate measure of all volatile compounds. DBPClam has battery power for 12 months of operation (15-min. sampling and 6 hourly uploads)

Proactive management of DBP production : increase the spatiotemporal resolution of DBP monitoring, supporting current methods of demonstrating compliance and helping to keep ahead of regulation.

It can be installed in subsurface chambers without an additional enclosure for security. It can fit into any small spaces available in existing above-ground cabinets.

#Clean water
#Sensors and monitoring

WATERSIGHT

Low-cost spectrometer-on-a-chip for online water quality analysis and condition-based monitoring

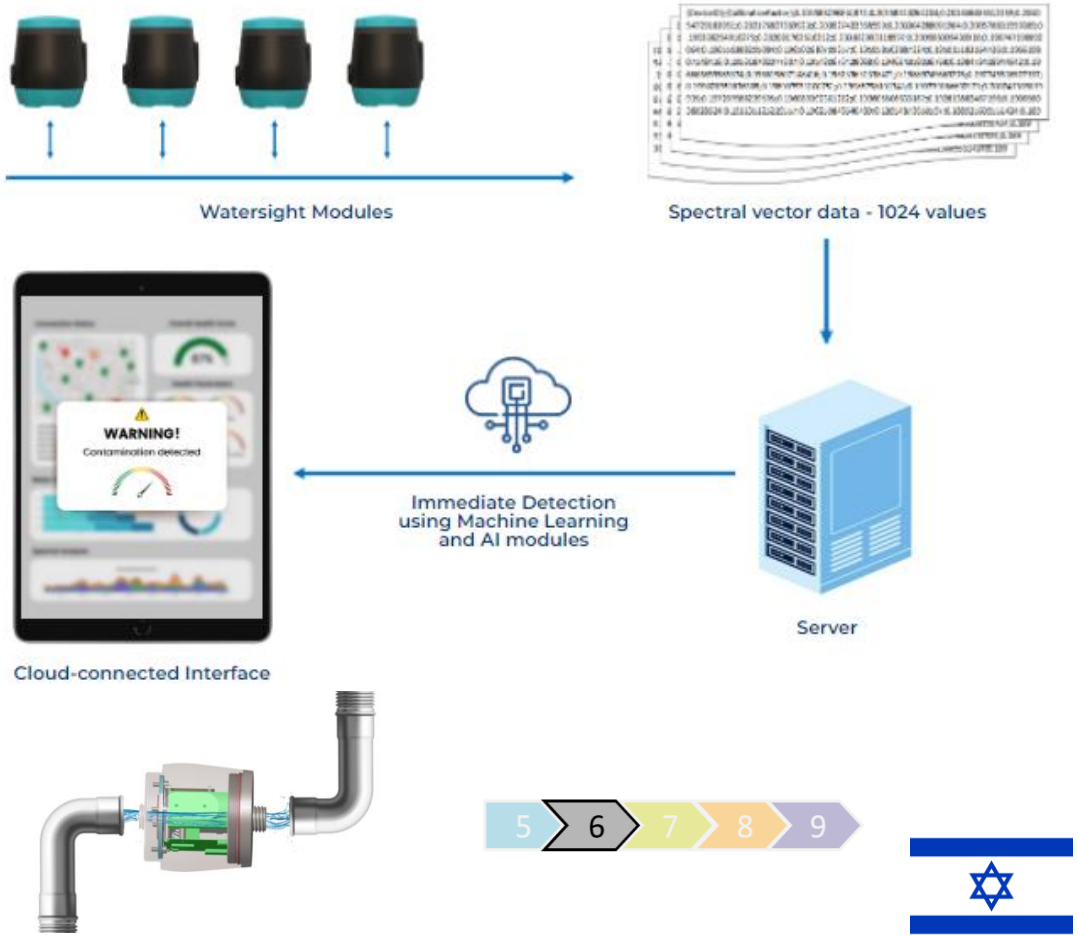
AI-backed spectrometer-on-a-chip solution, to monitor condition-based water quality. Takes up to 4,000 multispectral images per second, measuring 1024 absorbance values within the visible and near-infra-red spectrum (400 – 1000 nm)

These values are fed to machine learning algorithms. It sends alerts when the spectral fingerprint has changed.

Finds: presence of iron; a possible corrosion event; cyanobacteria in raw water; the change from one water source to another, in real-time; or the infiltration of contaminated water into a clean water system

Small enough for integration into current water line equipment such as valves and meters. It can also be installed in piping systems or submerged in tanks.

AquaRing



HULO

Leak Software

Network
Clean water
Operations and maintenance
Condition Assessment
Software - operational/modeling

Advanced algorithms for real-time leak detection, localization and sizing, supported by optimization of network sensor placement

HULO requires only a basic hydraulic model for leak localization and sizing. Networks with at least 1 flow sensor to any number of pressure and flow sensors available

One module is used to optimise the placement of sensors in the network, for leak localization or to support a network digital twin. Also used for DMA design.

Working with large data sets reduces the number of false positives compared to conventional leak detection software solutions. Technology requires 50% fewer sensors compared to traditional methods based on pressure/flow.

pH, salinity and turbidity sensor data can also be utilised for leak detection. Algorithms designed to be implemented in the customer's existing IT infrastructure

5 6 7 8 9

Asset Monitoring and Inspection

isle

Network
Clean water
Operations and maintenance
Sensors and monitoring
Condition Assessment

FIBERSENSE®

DigitalAsset and DigitalWater

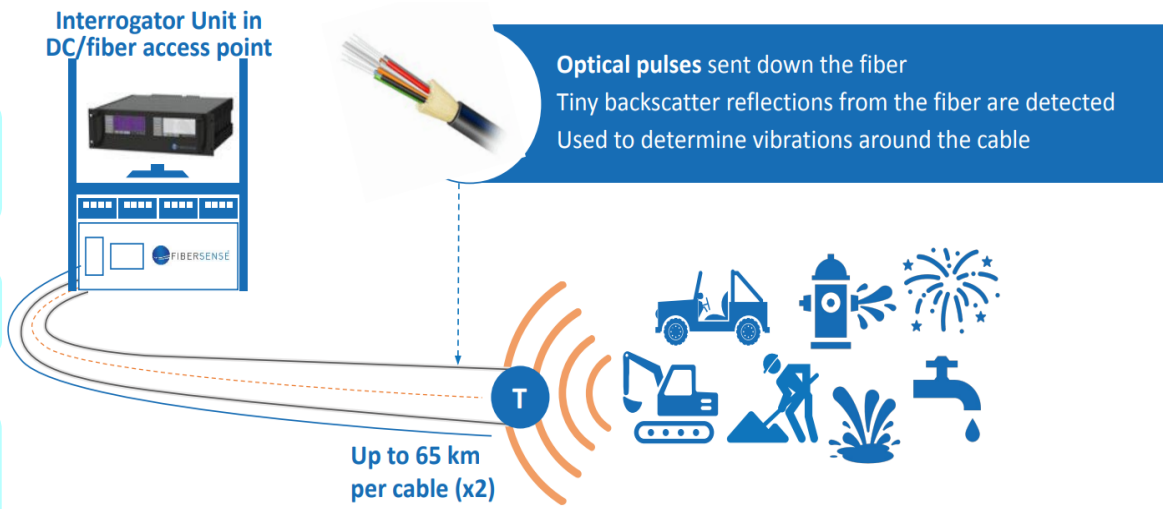
Underground asset monitoring and leak detection service using existing fiber optic cables.

FiberSense turns existing fiber optic cables into cost-effective sensing arrays, enabling to monitor underground assets that run parallel to fiber optic cables for damages and leaks.

The hardware component, connects to a separate fiber path. Vibrations for up to 40 miles (optical linear distance) are analyzed to characterize vibration sources.

Large coverage and low operating cost against point sensor solutions monitoring patrols. Detect the tell-tale vibrations of workers starting to dig, prioritize the threat and its exact location, and alert field forces to intervene

FiberSense monitors for external threats such as excavations (the DigitalAsset service). It can also monitor for bursts and leaks (the DigitalWater service).



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#Network
Clean water
Physiochemical
Condition Assessment

AQUAPRiORi

AquaTrioscope®

Measuring technology for rating the technical condition and the corrosion risk level of the water distribution network

Level of corrosion in iron, cast iron and steel pipes. A technician attaches a measuring device to a fire hydrant, flushing hydrant or fire water station

Electrochemical reactions are measured with 3 hydrodynamic variables: flow + pressure and water quality→ condition class and corrosion degree (dashboard)

Minimal hygiene risks because measuring devices are not inserted into pipes.

- Defining the baseline data for pipeline modeling, - Complementary to other techniques: CCTV in critical water mains, Electromagnetic spectrum

#Network
#Condition Assessment

Acquarius Aquabrella

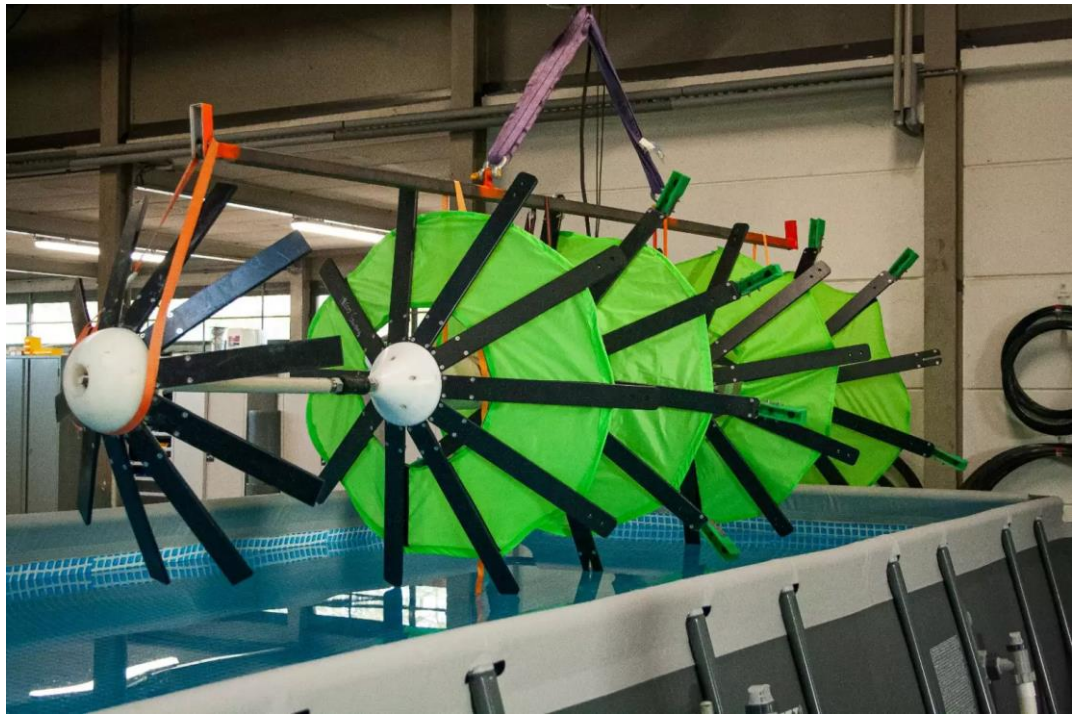
Inline inspection tool for water pipelines (Aquabrella) and water & wastewater pipelines (Acquarius)

Internal condition assessments for pressure and transport drinking water pipes with a diameter ≥DN400 (Aquabrella)

Free-swimming inspection tool with ultrasound, accelerometer, hydrophone sensors, and XYZ mapping

Pipe wall thickness, misalignments, wire breaks (PCCP), leaching, sulphate attack, coupling offsets, leakages. Insights into current condition and remaining life span.

Over 90% of failure modes are detected with a single inspection. Absolute and reproducible measurements, allowing asset owners to pin-point areas of increased risk of failure and act accordingly.



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5 6 7 8 9

Water Monitoring and Energy Recovery

WATER NETWORK MONITORING/ ENERGY RECOVERY

pydro WATER TO DATA

#Network
Clean water
Sensors and monitoring
Resource/energy efficiency
Resource recovery (inc. energy generation)

PYDRO's PT1

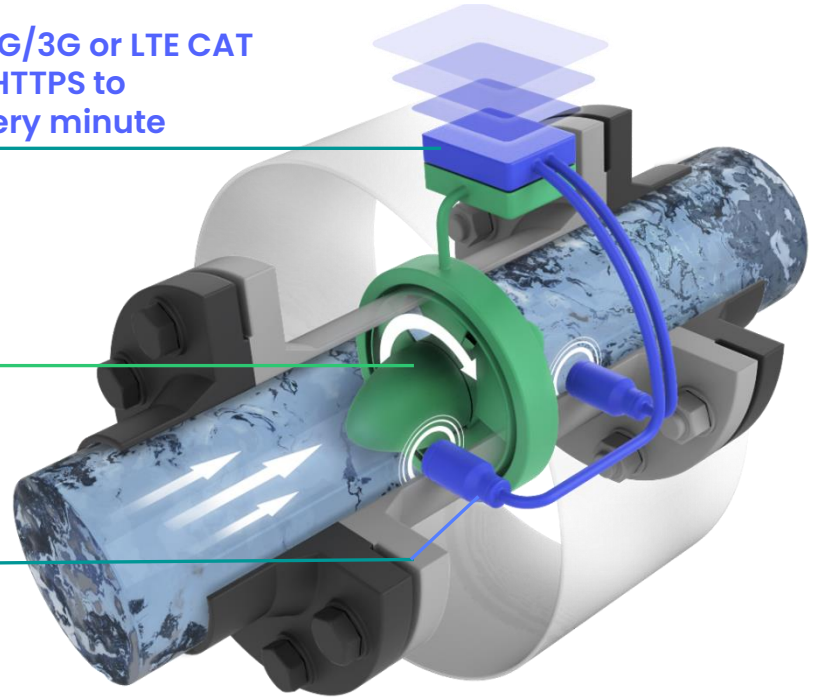
Self-Powered Smart Turbine Flowmeter.
Unlimited Real-Time Monitoring

Harvests hydro power at point of use. Measure flow pressure and temperature in real-time. Sends data in near- real time

Energy is generated from flow and stored in a backup battery to power the system

Data is sent via 2G/3G or LTE CAT M1 with MQTT or HTTPS to SCADA/cloud every minute

Real-time indications from the pipe network. Help utilities to focus their leak detection efforts. Prioritize which part of the network needs corrective measures and immediate attention



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ENERGY RECOVERY

Network
Clean water
Sensors and monitoring
Resource/energy efficiency
Resource recovery (inc. energy generation)

HydroXS®

Pressure recovery valve for pressure control and low-cost, clean electricity generation

Recovers and converts differential pressure in water pipelines into renewable energy- while accurately controlling pressure

It includes a microturbine, a generator, and a sophisticated control valve. Excess pressure is converted into electricity

A control dashboard provides real-time, continuous data on flow, upstream/downstream pressure, and energy production.

Monitoring and control are easily integrated into existing control valves and new pressure management systems and SCADA

5 6 7 8 9

WasteWater Monitoring

Wastewater Treatment
Operations and maintenance
Sensors and monitoring
Physiochemical

ASPI

In-process Liquid Sampler

Fully immersed, multi-parameter analyser for monitoring of biological wastewater treatment

The analyser is immersed in turbulent aeration basin environments to monitor secondary treatment performance.

Capture technique to collect and stabilise 1 L of process fluid. The ILS houses various sensors. Able to give parameters that would otherwise require laboratory analysis.

Raw and calculated data are displayed via a Bluetooth-connected device and sent via MODBUS to plant. Sensor analyses MLSS, sewage sludge (SSL), SVI, supernatant clarity. Self cleaning sensors.

Primarily used in biological WW treatment but also for algae analysis, oil & gas, distilling and industrial applications in which monitoring of settlement or bacterial activity is required.

#Wastewater
#Treatment
#Sensors and monitoring

AM TEAM
Advanced Modelling for process optimisation

CFD-N_2O Model

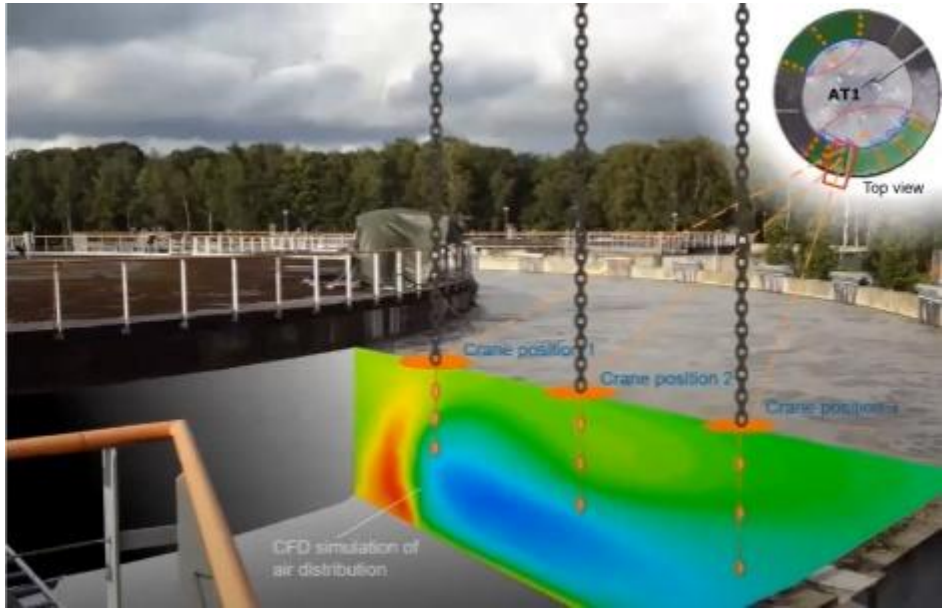
3D simulation tool for assessment and mitigation of N_2O emissions and optimisation of plant performance

CFD-N_2O model is a highly realistic mechanistic model, which provides an 'X-ray' view of N_2O production and emissions inside bioreactors.

It combines advanced computational fluid dynamics (CFD) and kinetic process simulation. This 3D simulation reveals the root cause of N_2O emissions, allowing scenario testing with the same model for effective mitigation.

Predicts the individual production pathways of N_2O at various spots in the bioreactor and local hotspot concentrations in new or existing plants.
It can be immediately applied without additional data collection.

1) effective N_2O assessment and mitigation; 2) enhancing process performance (effluent quality); 3) saving costs (energy, experimental measurements, footprint); and 4) saving time (less piloting, faster troubleshooting).



Planning Strategy

Business

Water Demand forecasting

Asset renewal

Water resource management

Water resilience

#Network
#Clean water
#Operations and maintenance
#Sensors and monitoring

SME WATER

PARADIGM

Water demand analysis and forecasting tool

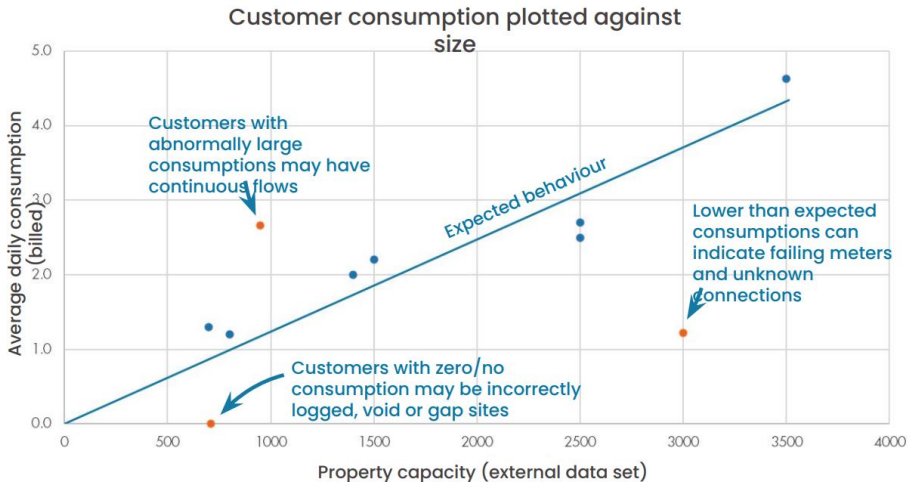
Detailed water demand model, that is highly representative of real behaviours.

Demand breakdowns include consumption forecasts (at DMA level) and expected burst flows. PARADIGM includes techniques to identify the likely causes of problems (e.g., identifying individual unmetered customers)

Processes data collected from multiple water utility clients. Particularly useful for clients with minor representation of a demand component

Validation of customer consumption, identifying lost revenue and influencing behaviour to reduce consumption; separation of leakage from demand, supporting effective leak reduction programmes

Paradigm Customer Analysis



#Wastewater
Network
Clean water
Asset renewal and rehabilitation
Software - planning/strategy/business
Software - operational/modeling

Spatial insight

BESTNET SI-REHAB

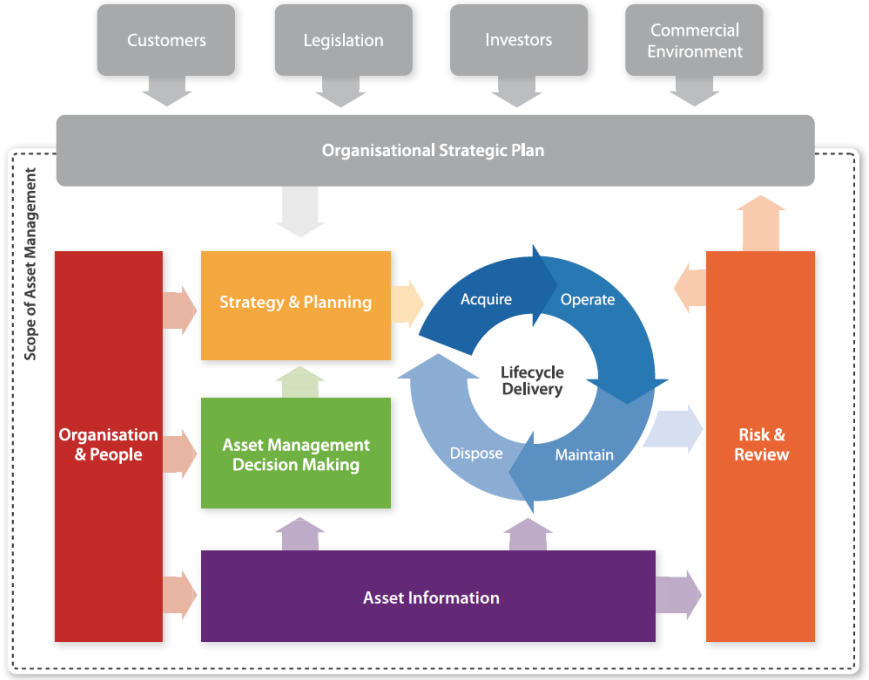
Combining multiple pipe rehabilitation models to optimise asset management programmes.

A tailored combination of pipe replacement models is run on existing data sets helping making decisions on the replacement of pipes to reduce non-revenue water.

Decision support software BestNet enables to: combine risk models for pipe replacement, compare the effect on performance of replacement scenarios, generate projects ready-for-execution

BestNet has been shown to reduce the volume of leakage by up to 1.5%,

SI-Rehab,' risk software for pipe replacement
• calculates the risk of failure for each 10m pipe segment in the network



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#Network
#Urban Resilience
#Software - operational/modeling

Vassar LABS

aquaWISE

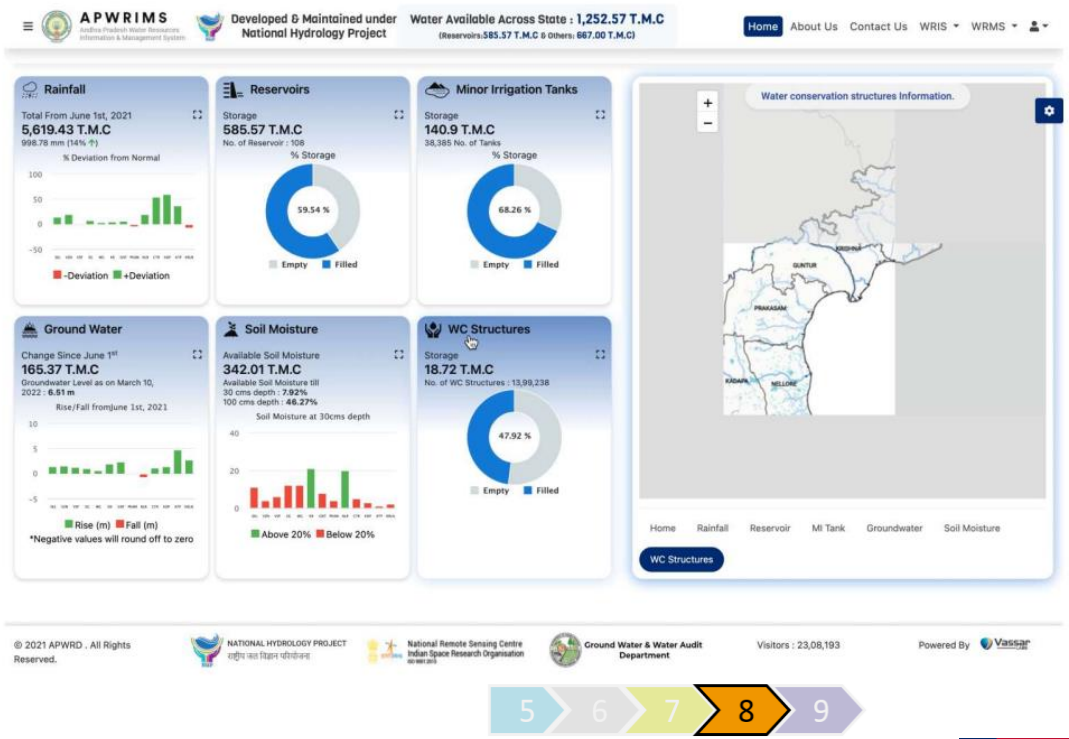
Integrated water monitoring and management system for planning and utilisation of water resources and assets.

Web based platform used to manage water resources through the creation of a digital twin for both the natural system and conveyance system. Data collected from sources like IoT sensors, satellites and drones, GIS and hydrometeorological databases

Data is then transformed into actionable insights to support a holistic approach to water management that considers all aspects of the water cycle. Each stakeholder is provided with customised dashboards and workflows specific to their tasks.

Visual representation of the current condition along with forecasted views and simulations. GIS portal, analytics, dashboard elements and smart widgets

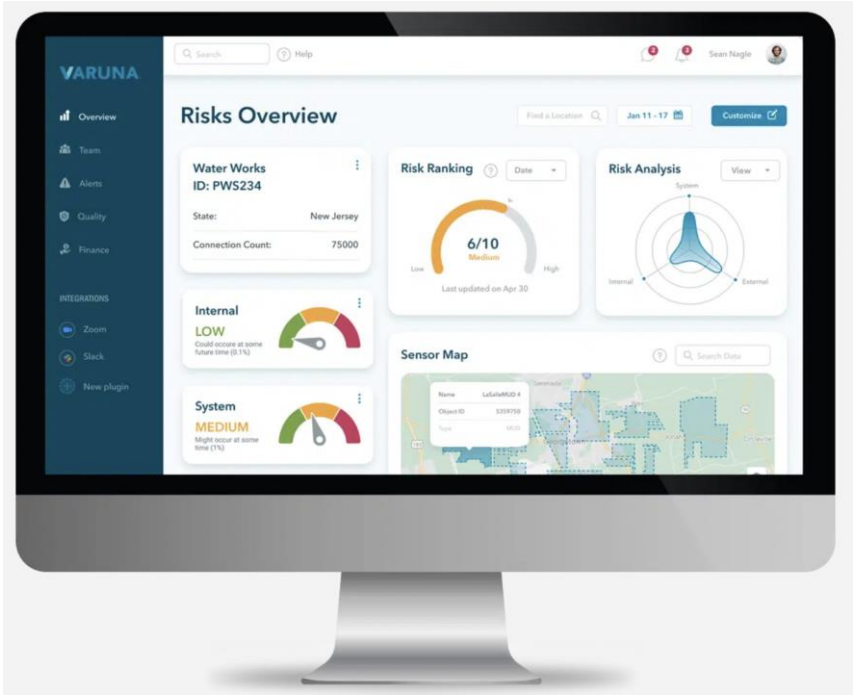
Supply deficits by lifting water from surplus basins and provide real-time operational insights through dashboards. Water supply planning across cities and municipalities, periodical assessment of land use changes



#Network
#Clean water
#Operations and maintenance
#Catchment Management
#Software - operational/modeling

VARUNA™

Resilio.io



Adaptive emergency planning and resilience software dashboard for tracking and prioritizing water system risk.

Adaptive emergency planning and resilience software dashboard for tracking and prioritizing water system risk that would negatively impact operators' ability to provide safe drinking water to customers.

Aggregates data from multiple sources (CMMS, SCADA data, historical records) under three vectors of risk (internal, external, systemic) to generate a risk profile.

Suitable for water utilities that do not have, or have only static, emergency and resilience plans that want to maintain ongoing visibility over their emergency preparedness and resilience efforts.

Generate an immediate remediation plan that recognizes the current/real-time internal, external, and system states of the water system

Relevant Reference Projects

Methodology

Service Description

- ✓ **Horizon Scanning** is a proven methodology. We screen the world for innovative technologies within a specific scope and compare the technologies using criteria relevant to the client(s).
- ✓ The technology evaluation is done through direct contact with technology providers, speaking with customers for validation of references, desktop-study assessment.
- ✓ After the initial screening and technology evaluation, Isle applies a technology scoring to prioritise the most appropriate technologies.
- ✓ The technology scoring is done through specific parameters curated to customer criteria (CAPEX, OPEX, TRL, …) and validated with the technology providers. This allows the end-user to understand the technology options and make informed decision.

Leak Detection Sensors

Challenge: Reduce non-revenue water in their drinking water distribution network and increase digitalisation

Results: Eleven (11) technologies identified for the detection of leaks using different working principles

Customer: Utility Norway, Europe
Date: 2021

- Utility has tested a few leak detection sensors but wanted to have good **overview of the options on the market** and a selection of technologies that fit in the local needs.
- Transformation to the digitalised world by reviewing a combination of sensors, suitable **communication networks and data analytics (artificial intelligence platforms).**
- **Conducted a technology horizon scan** by reviewing the Isle database and completed an open search to identify technologies which can work in the defined local context.
- **Evaluated the suitability of the solutions** and availability for working in Oslo, having local presence or have carried out trials.

Partner Projects

- We believe that **through collaboration, we can solve the shared challenges** faced by our clients.
- We are offering several different 'partner projects' to enable our clients to develop informal partnerships with one another, enabling them to **collaboratively procure research** and be an active player in our global network. **Participants learn from one another**, **sharing opinions and knowledge** to strengthen the outputs of each project, and have cutting edge knowledge on key topics to hand.
- Finalisation of the Partner Project scope is held in conversation with interested parties. Typically a Partner Project involves 4- 10 collaborators. **Project cost is shared between collaborators** in order to be very cost effective.
- The projects every year cover topics from resource recovery and nature-based solutions through to asset management and smart water systems **depending on the needs of the water utilities we closely collaborate with**.

Partner Projects

THE ROLE OF A SMART WATER UTILITY IN A CITY

The creation of water-smart cities is a complex process. However, the benefits outweigh the costs, as they make it possible to offer an excellent service to the population and build a more resilient and sustainable future.

Identification of successful cases of smart water services within smart cities in the world, highlighting key approaches and main features, what connections are made amongst the different sectors, and their **impact on the citizens and the environment** plus

Interview of those successful smart water approaches within the Smart City Case Studies, learning what alliances have been made between stakeholders, identifying how challenges/barriers have been overcome and lessons learned

ISLE at Aquatech

Eva Martínez
15 Top Emerging Technologies in the Digital Water Space

Ioanna Livaniou
15 top emerging technologies in Clean Water Space

Karen Clode
15 top emerging technologies in wastewater treatment & resource recovery

Peter Wessels
Water Management in Industry: Optimizing Reduction, Efficiency, and Investment

Contact Us

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