AquaSPICE

Advancing Sustainability of Process Industries through Digital and Circular Water Use Innovations

Final Conference

12th December 2024

Thomas Wintgens (RWTH Aachen University)

The AquaSPICE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958396.

RELEVANCE AND PROJECT OBJECTIVES

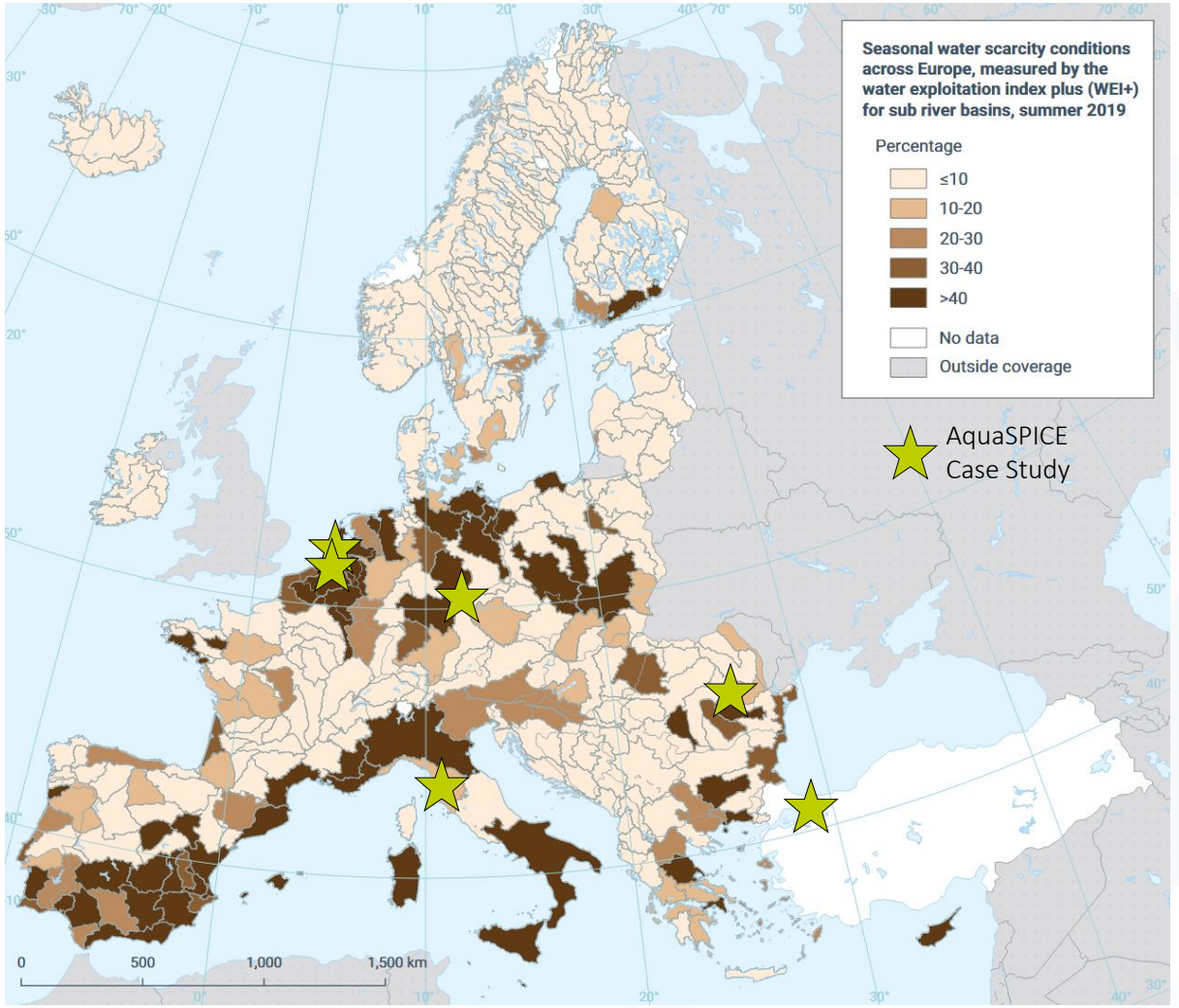
Final Conference

Climate change leads to **increasing water scarcity** problems

Global water use: Increase at more than twice the population growth rate during the last century

SDG 6: Ensure the availability and sustainable management of water for everyone

Industry relies on a sufficient water supply: Water is an essential component in almost all production processes



Water Exploitation Index Plus adapted from © EEA Copenhagen, 2023, EEA Report 07/2024, Europe's state of water 2024

EU GREEN DEAL

https://www.consilium.europa.eu/en/policies/green-deal/

- **Vision:** Make the EU the first climate-neutral area in the world in 2050, cutting pollution and restore a healthy balance in nature and ecosystems

Climate neutrality

Drastic reduction of greenhouse gas emissions for the EU to become the 1st climate-neutral area in the world

Circular economy

New economic model where products are reused, repaired and recycled, reducing waste and conserving resources

Clean industry

Push for cleaner, more sustainable and energy-efficient industries which thrive in the EU and global markets

Healthier environment

Plan to restore nature and work towards zero pollution to ensure a healthy environment for future generations

More sustainable farming

Greener farming practices to protect the environment while providing healthy and affordable food

Climate justice and fairness

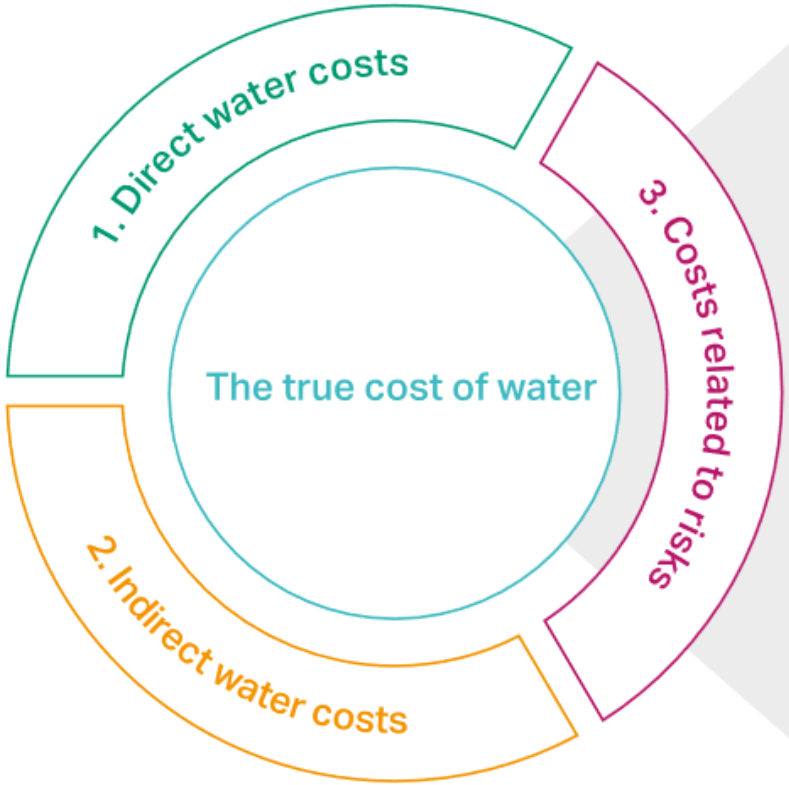
Plan to make the transition fair and inclusive to help people most affected by the transition and leave no one behind

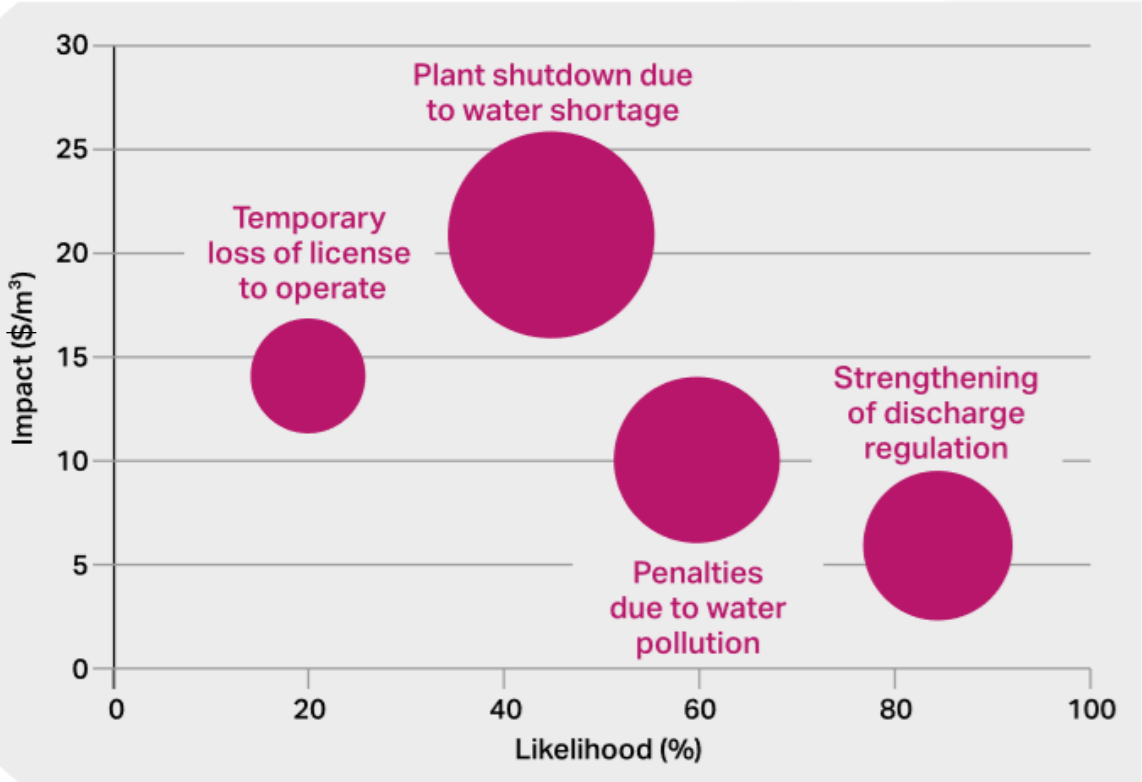
INDUSTRIAL EMISSIONS DIRECTIVE 2.0

- Revised IED in force of 24th of April 2024, part of Zero Pollution Action Plan and key component of EU Green Deal
  - Tighter pollutant emission limit values are required to be used by Member State permitting authorities
  - Establishment of EU Innovation Centre for Industrial Transformation and Emissions (INCITE)
  - Extension of IED coverage to additional facilities (from 57 000 to 75 000 installations)
  - Increased focus on energy, water, and material resource efficiency and reuse, as well as promoting the use of safer, less toxic, or non-toxic chemicals in industrial processes
- IED is based on Best Available Techniques Reference Documents (BREF), i.e., Industrial Cooling Systems, Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector, …
  - Updates in progress …

RELEVANCE AND PROJECT OBJECTIVES

Industry has **major role in mitigation of climate change** and the fulfilment of the targets of the **Paris Agreement/European Green Deal**





Source: WBCSD, 2017

The graph represents an example of identified risks during the analysis. Each risk is plotted on a graph based on its probability and potential economic impact.

RELEVANCE AND PROJECT OBJECTIVES

AquaSPICE aims: (1) **Materializing circular water use** in European process industries,

(2) **fostering awareness in resource-efficiency** and

(3) delivering **compact solutions** for industrial applications.

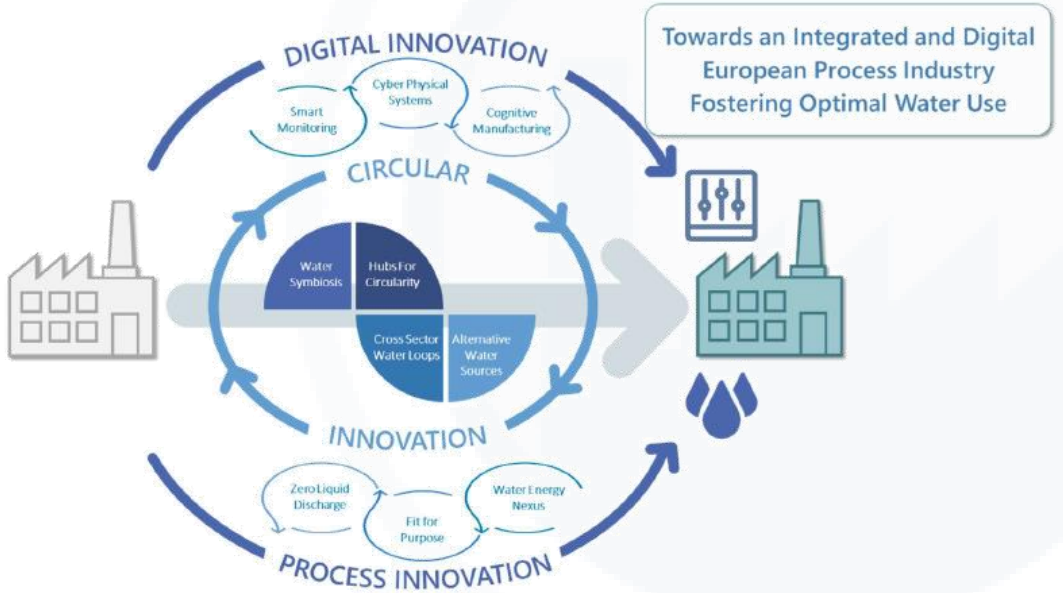
Main pillars

I. Multiple **state-of-the-art water treatment and re-use** technologies

II. Diverse **closer-loop practices** regarding water, energy and substances

III. **Cyber-physical-system** in the form of a system for real-time monitoring, assessment and optimization of water (re-)use at different interconnected levels

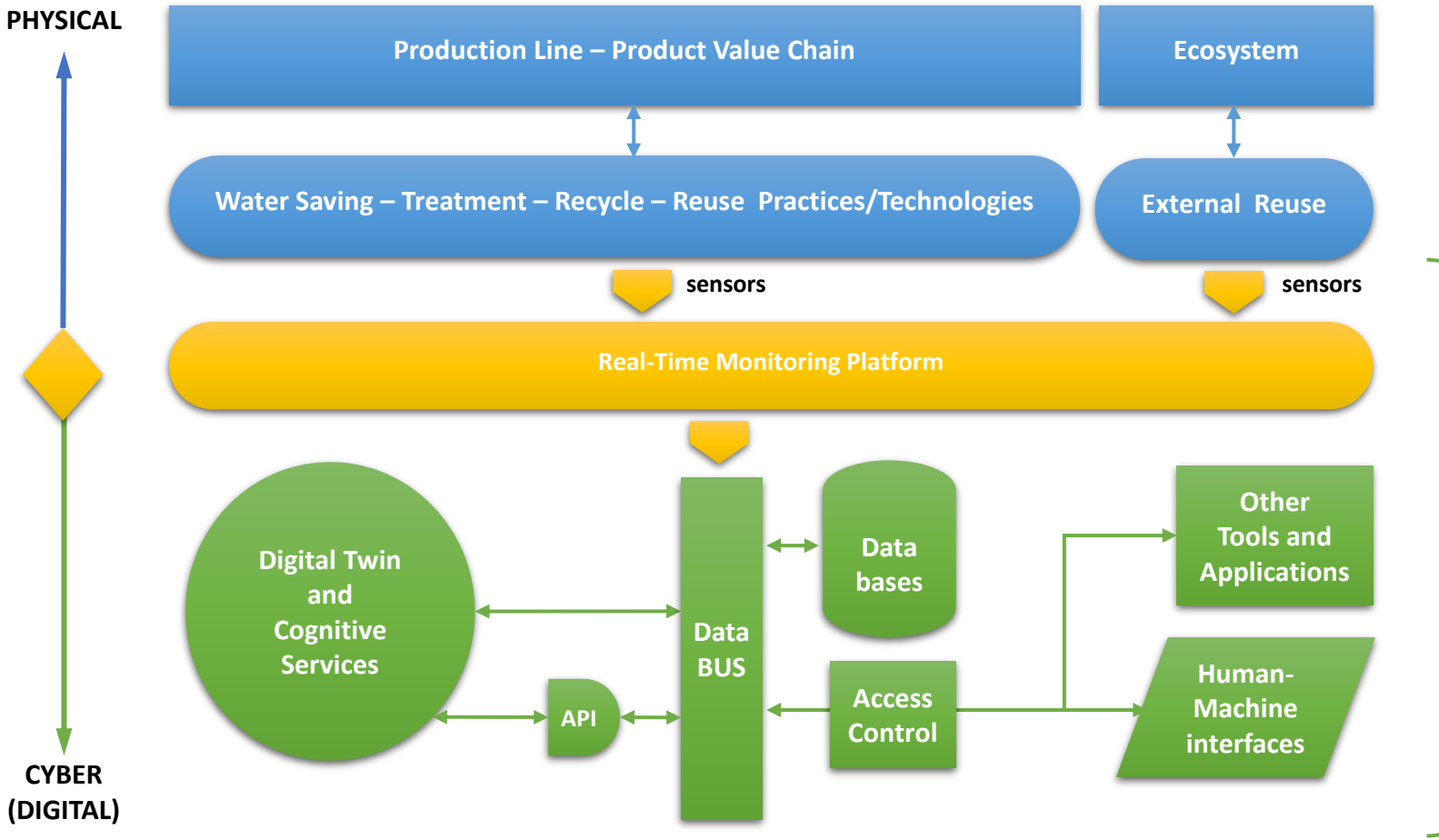
IV. Effective methodological, regulatory and business **framework**



(EXPECTED) IMPACTS

1. Significant **reduction of current use of fresh water** resources
2. Significant steps towards **closed-loop systems** in industrial processes
3. Significant **increase of recovery of water, energy and/or substances and materials**
4. Effective **dissemination** to the current and next generation of employees
5. **Demonstration of environmental gains**
6. **Replication potential**

WaterCPS CONCEPT

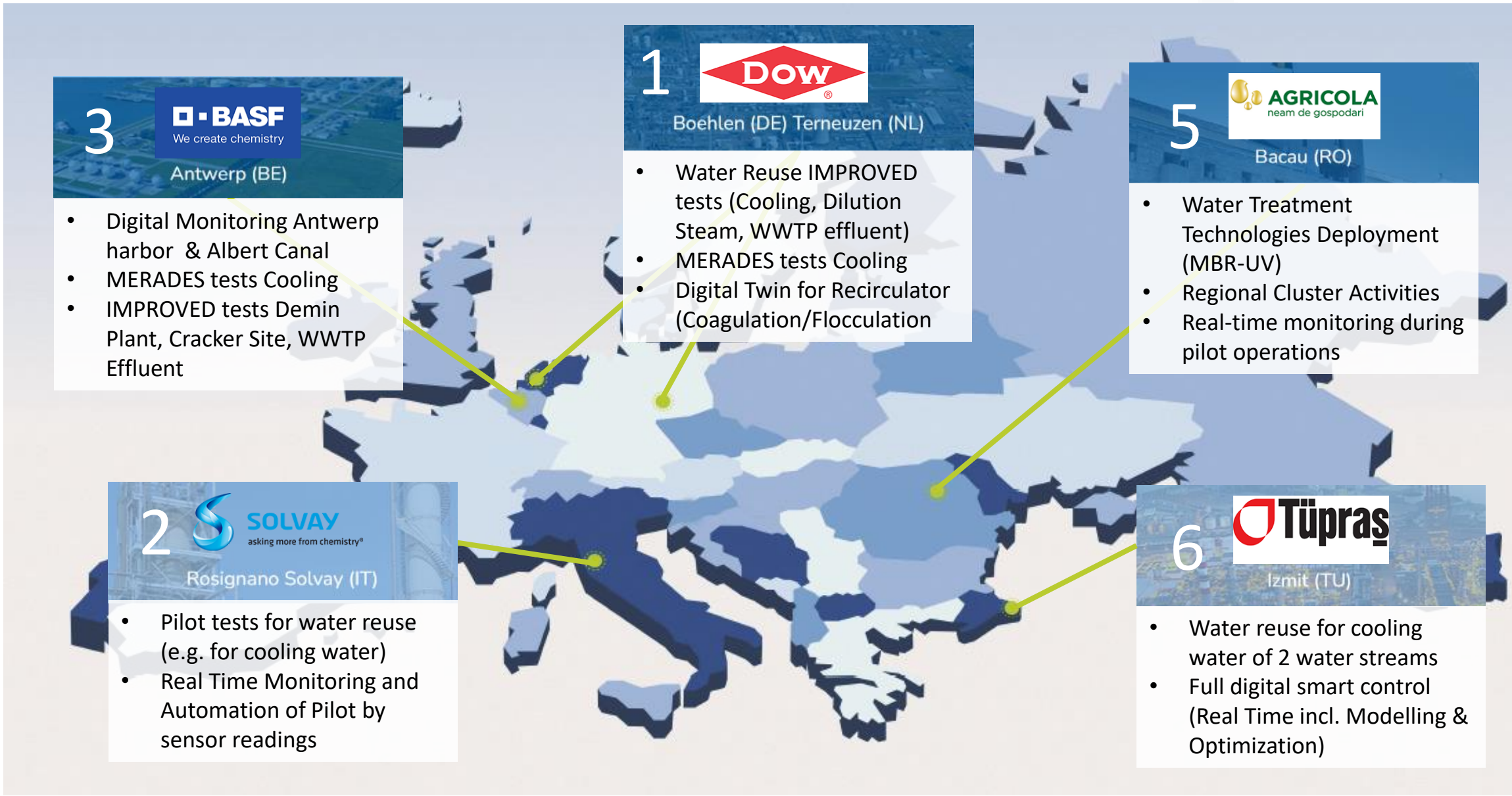


AquaSPICE Expectation

The cyber part of WaterCPS and its integration with the water efficiency technologies & practices can create significant added value for industries and have a measurable impact on water efficiency

PROJECT PARTNERS

CASE STUDIES



1 DOW
Boehlen (DE) Terneuzen (NL)

- Water Reuse IMPROVED tests (Cooling, Dilution Steam, WWTP effluent)
- MERADES tests Cooling
- Digital Twin for Recirculator (Coagulation/Flocculation

2 SOLVAY
asking more from chemistry®
Rosignano Solvay (IT)

- Pilot tests for water reuse (e.g. for cooling water)
- Real Time Monitoring and Automation of Pilot by sensor readings

3 BASF
We create chemistry
Antwerp (BE)

- Digital Monitoring Antwerp harbor & Albert Canal
- MERADES tests Cooling
- IMPROVED tests Demin Plant, Cracker Site, WWTP Effluent

5 AGRICOLA
neam de gospodari
Bacau (RO)

- Water Treatment Technologies Deployment (MBR-UV)
- Regional Cluster Activities
- Real-time monitoring during pilot operations

6 Tüpraş
Izmit (TU)

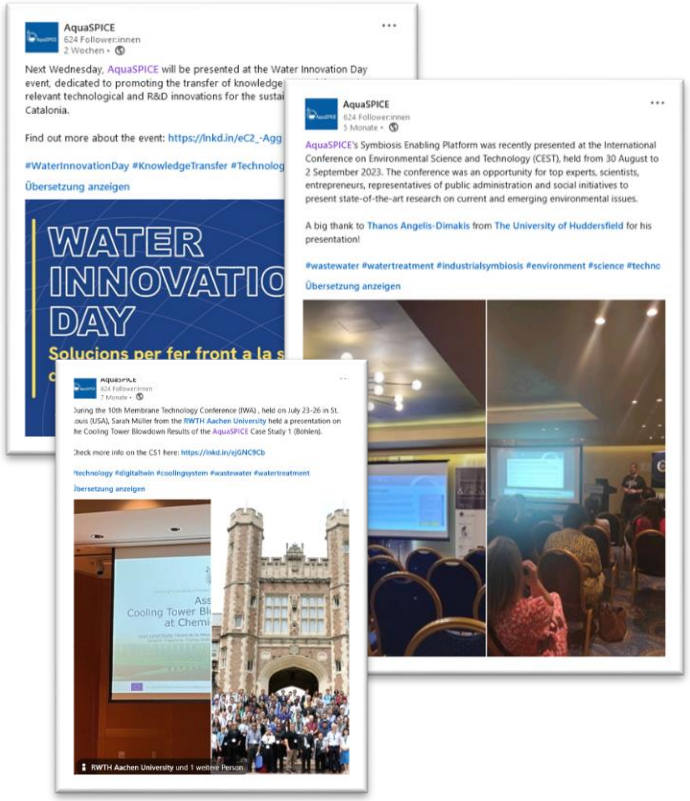
- Water reuse for cooling water of 2 water streams
- Full digital smart control (Real Time incl. Modelling & Optimization)

PROJECT RESULTS AND DISSEMINATION

Pilots …

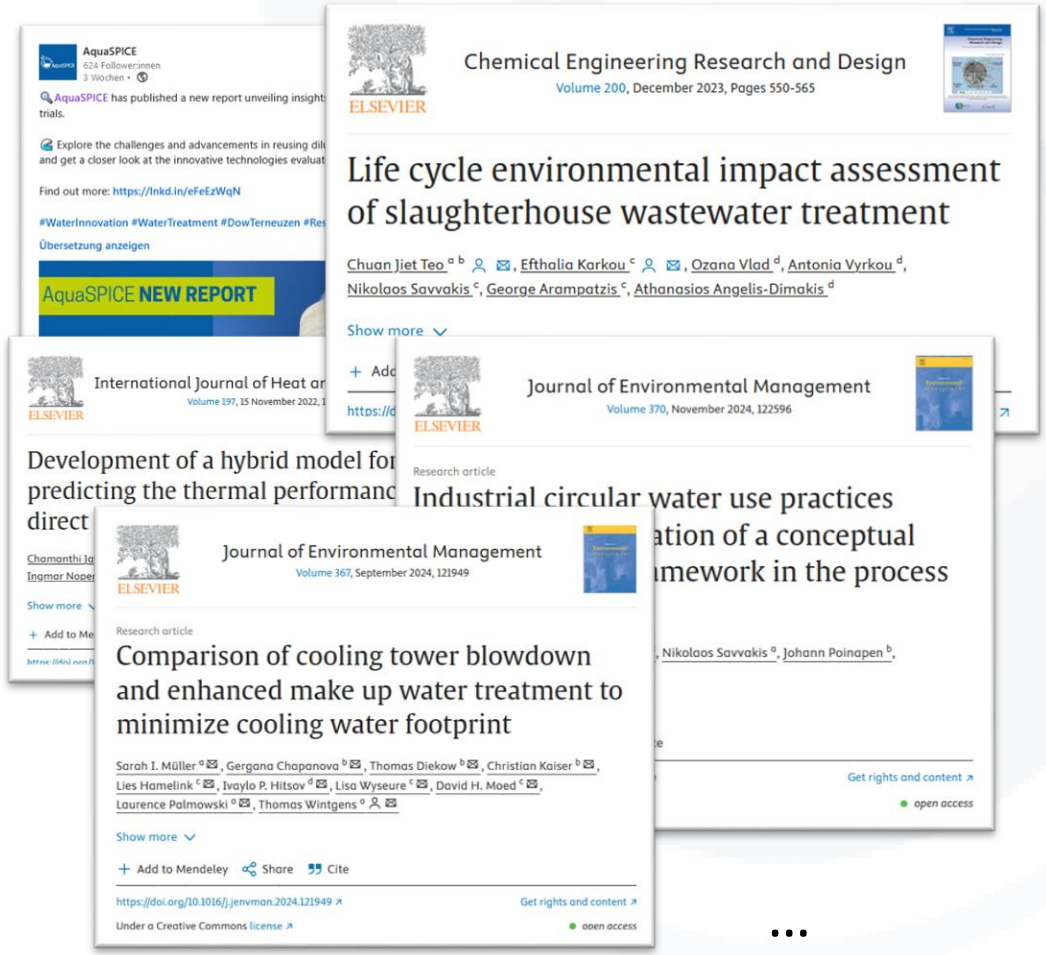
…

Presentations …



…

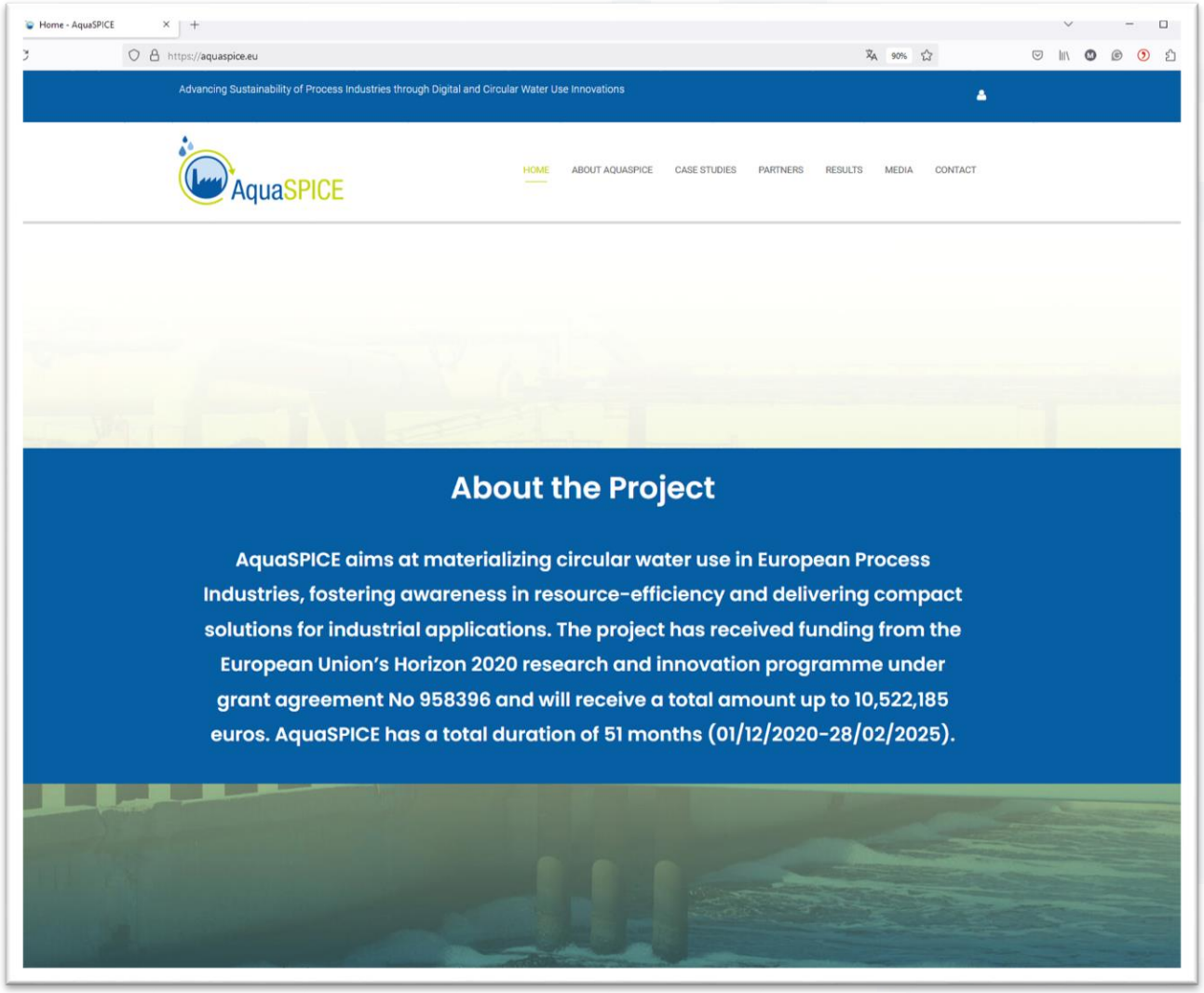
Publications …



…

PROJECT WEBSITE

www.aquaspice.eu



AquaSPICE

Advancing Sustainability of Process Industries through Digital and Circular Water Use Innovations

Thank you for your attention!

The AquaSPICE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958396.

info@aquaspice.eu www.aquaspice.eu aquaspice aquaspice