ULTIMATE

WATER SMART INDUSTRIAL SYMBIOSIS

ULTIMATE promoting water smart industrial symbiosis

Joep van den Broeke & Gerard van den Berg | KWR Water Research Institute, NL

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CIRSEAU
Building a water-smart economy and society

ULTIMATE indUstry water-utiLiTy symblosis for a sMarter wATer society

Funding program and call identifier: *H2020_CE-SC5-04-2019 Building a water-smart economy and society*
Project period: May 2020 - October 2024
Website: www.ultimatewater.eu

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

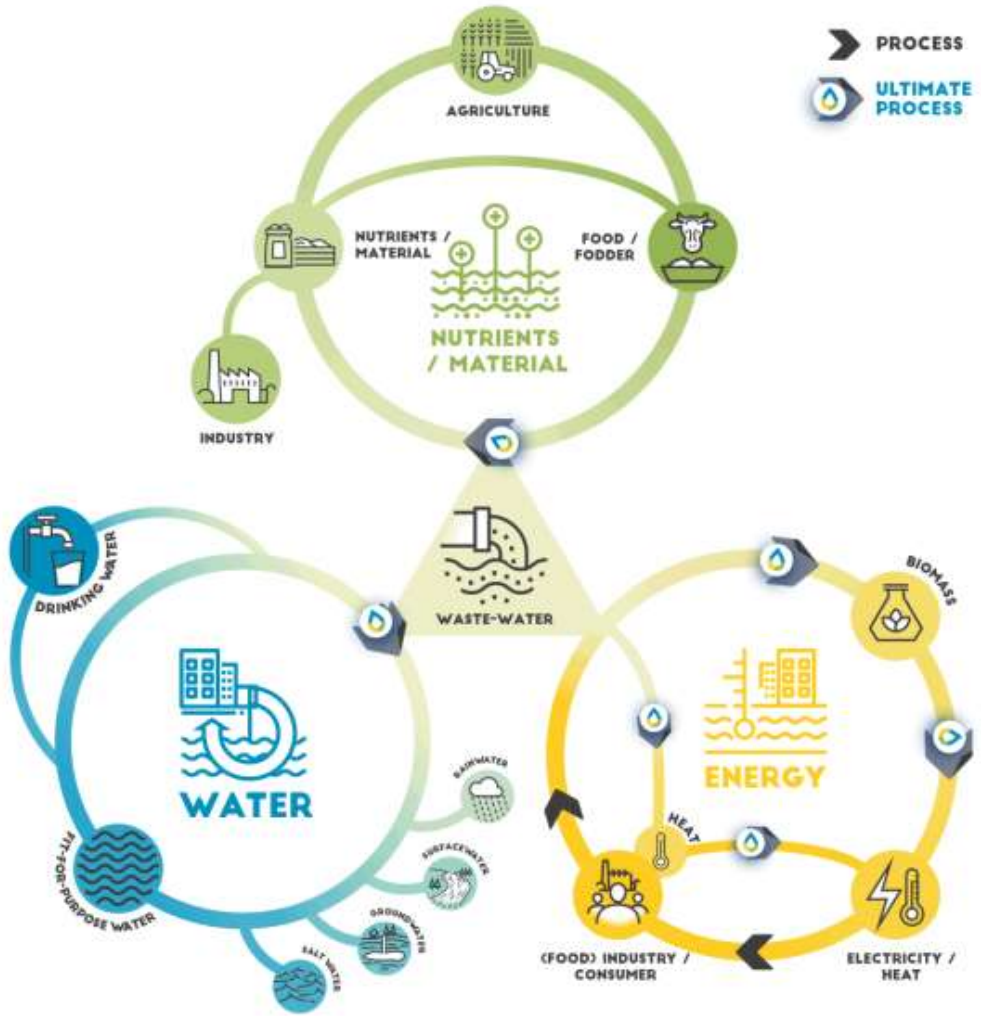
Introducing ULTIMATE

indUstry water-utiLiTy symblosis for a sMarter wATer society

Develop, optimize, and demonstrate ***Water-Smart Industrial Symbiosis*** technologies and solutions for:

- **Water reclamation and reuse** (recovery, refining, and reuse of municipal and industrial wastewater)
- **Exploitation of energy and heat** (extraction of energy, combined water-energy management, water enabled heat transfer, storage and recovery of heat)
- **Nutrient and material recovery/reuse** (nutrient mining, extraction/reuse of high-added value exploitable compounds)

Technological innovations are made available and shared through the **Water Europe MarketPlace**



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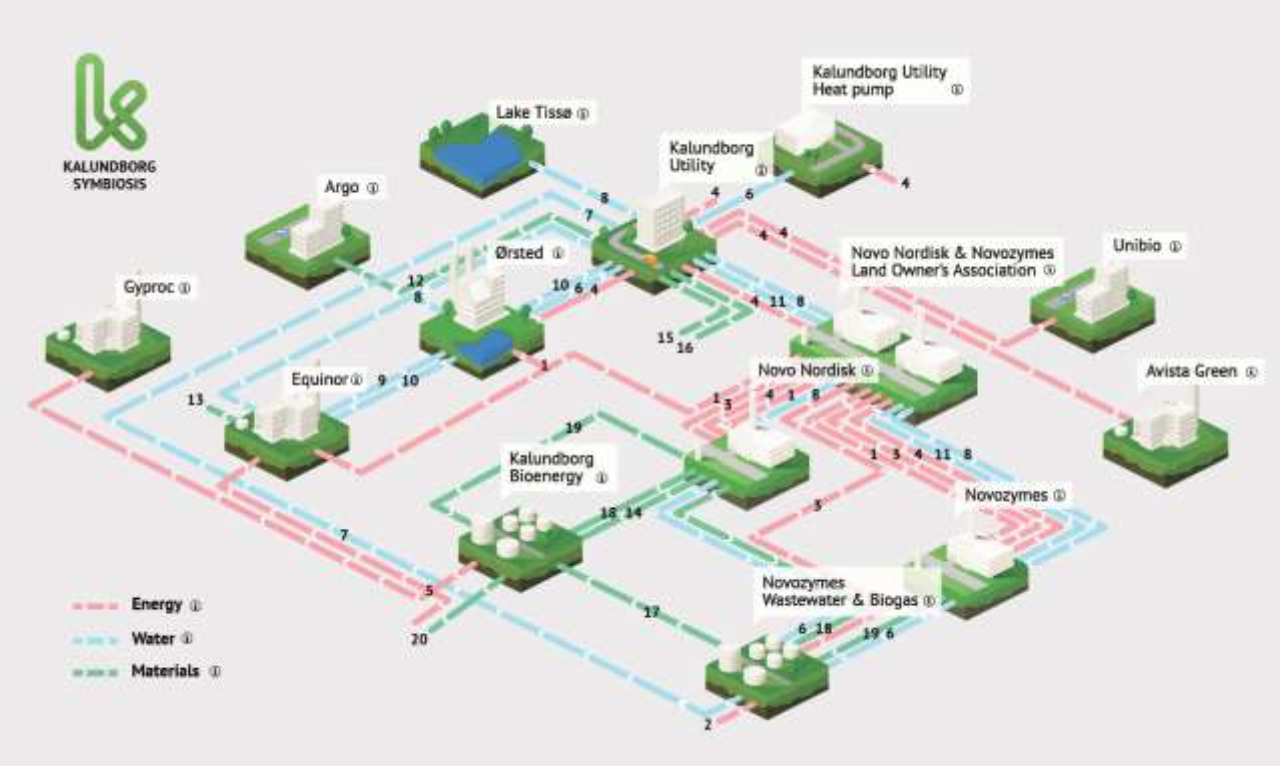
Industrial symbiosis

First industrial symbiosis plant worldwide in Kalundborg (since 1972).

The cooperation between the companies in the symbiosis provides mutual benefits, economical as well as environmental.

The main principle is that a residue from one company becomes a resource in another.



From: http://www.symbiosis.dk/

Water Smart Industrial Symbiosis (WSIS) aims to create economic value and increased sustainability by introducing circular symbiotic arrangements between industry and water service provider.

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We leverage much more than "just' technologies to achieve these objectives!

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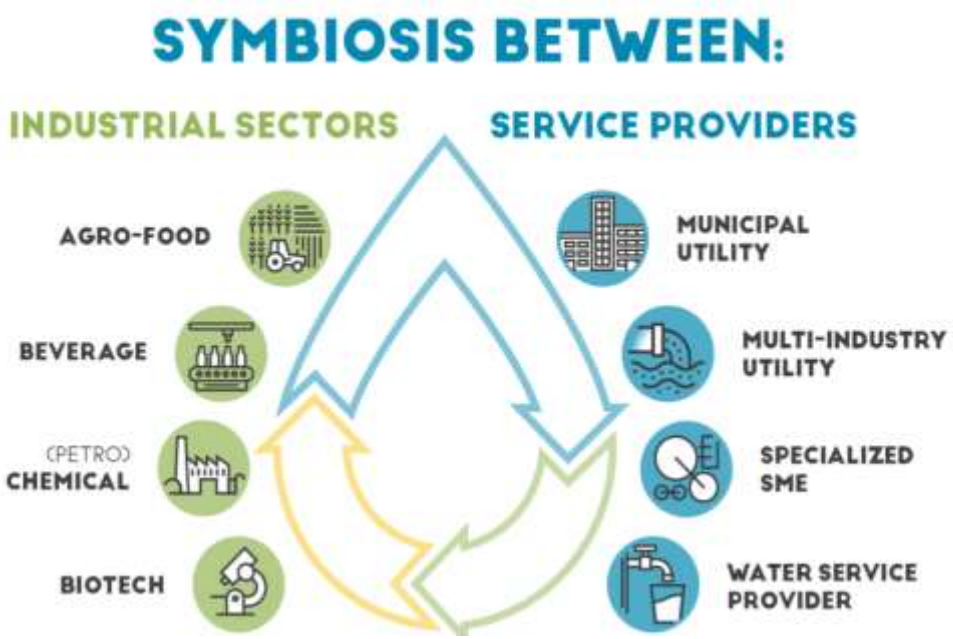
The core of ULTIMATE – integrated case studies

Concepts are developed for and validated in 9 case studies across Europe



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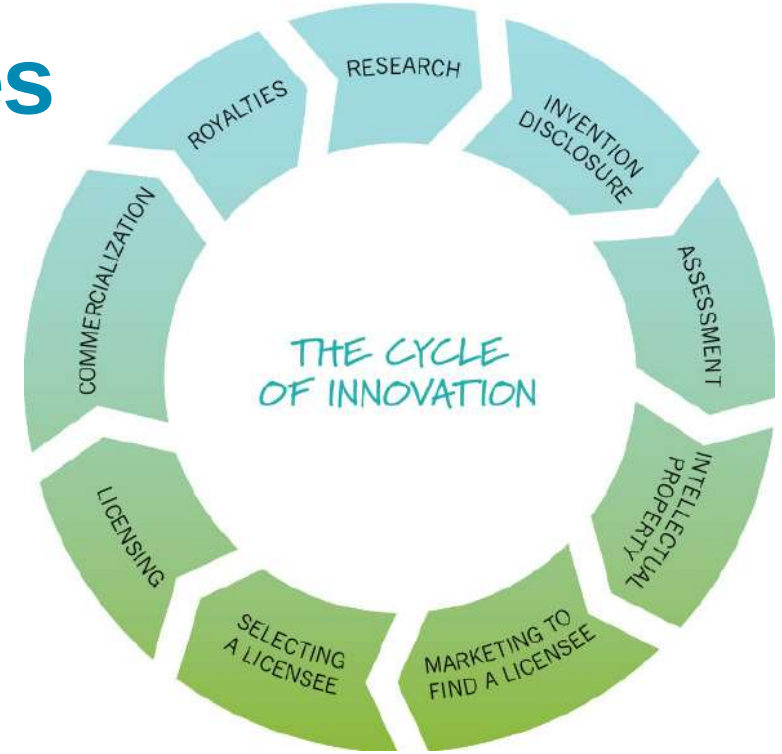
Exploitation / valorisation schemes



Develop new exploitation and valorisation schemes based on business models and services tailored to WSIS

Value chains for recovered resources are exploited by symbiotic arrangements between industries and water service providers:

- **Partnerships** between industries and municipal water utilities looking for symbiotic gains
- **Co-ownership** of water service providers by co-located industries to catalyse symbiosis
- **WSIS service provision** to industries by commercial companies of various scales: from niche SMEs to multinational corporations

Supported by:

- assessing the impact with life cycle (LCA, LCCs) and risk (QMRA, QCRA) analysis
- performance validation and certification schemes

Stakeholder Engagement

Promote active stakeholder engagement, innovation, co-creation and public awareness **to accelerate socio-economic and business transformation** towards a WSIS

Novel approaches include a.o.:

- Communities of Practice (COPs)\
- Co-creation
- Living labs
- Multi-use playspaces

ULTIMATE stakeholder approaches

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Ultimate solutions involve circular economy technologies

- Membrane technologies
- Adsorption technologies
- Electrostimulated systems

- 22 pilot plants
- 3 control and/or early warning systems
- 6 concept studies

- Biogas technologies
- Heat recovery
- Digitalization

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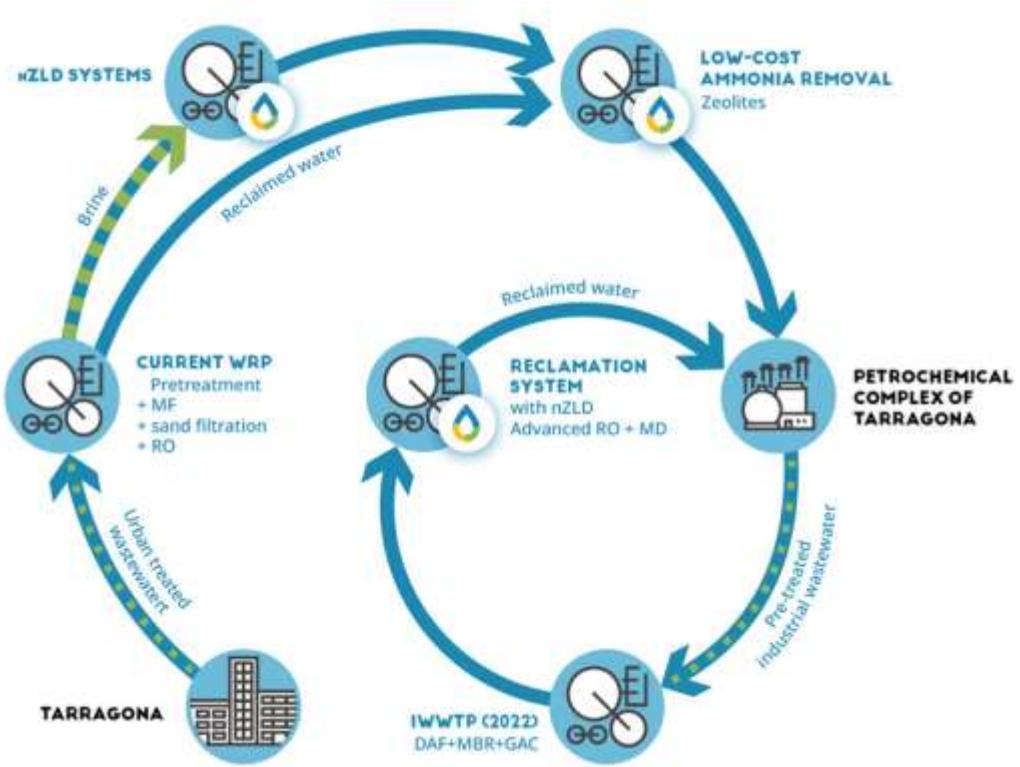
CS1 Tarragona (ES)

- Petrochemical complex (> 100 chemical companies) & municipal WWTPs
- Fit-for-purpose water for industrial reuse
- Long experience with water reuse

Membrane distillation

BRINE

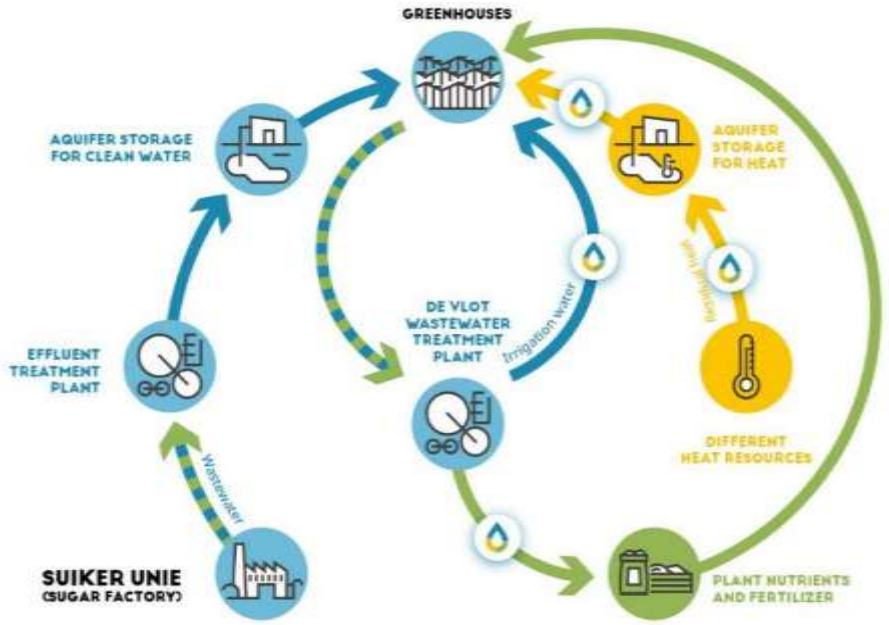
Ultrafiltration &
Reverse osmosis



Zeolite column for
NH_4 removal

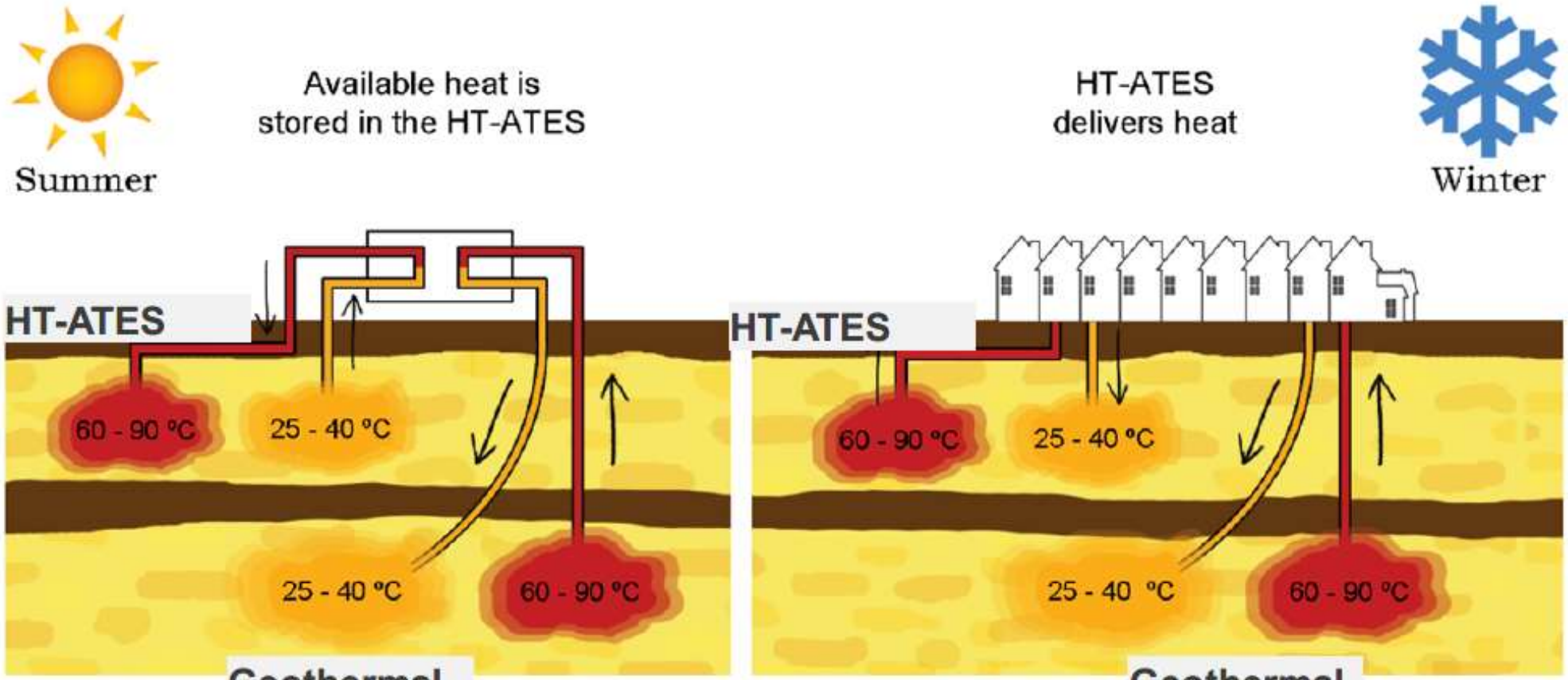
CS2 Nieuw Prinsenland (NL)

- Greenhouses
- Feasibility study: Heat management via high temperature aquifer thermal energy storage
- Fit-for-purpose water for irrigation incl. nutrients



Electrodialysis to remove salts

High Temperature Aquifer Thermal Energy Storage (HT-ATES)



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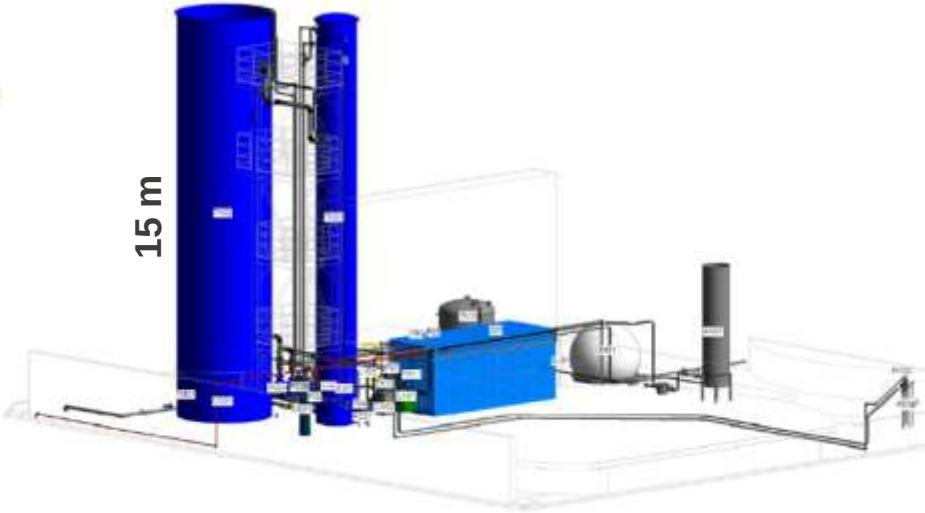
CS5 Lleida (ES)

- Brewery
- Biogas production
- Heat & electricity production
- Fit-for-purpose water for industrial reuse and irrigation

Pilot: electrostimulated anaerobic reactor

Anaerobic membrane bioreactor

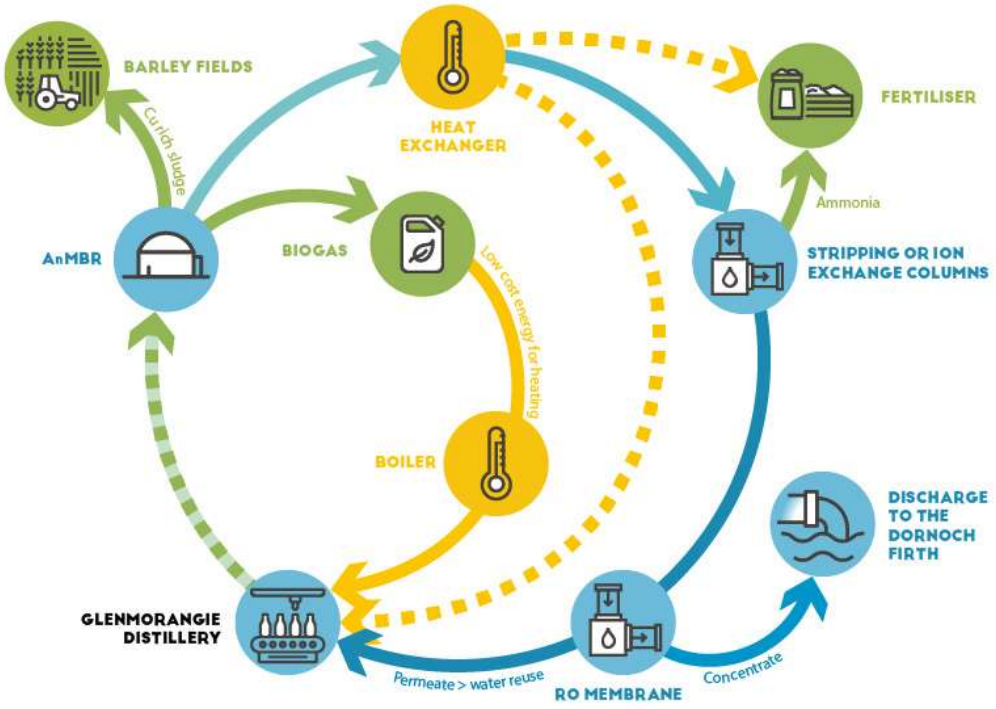
Full-scale: electrostimulated anaerobic reactor



CS7 Tain (UK)

- Whiskey distillery
- Biogas production, heat recovery
- Struvite and ammonium sulphate production (P and N removal and recovery)
- Fit-for-purpose water for industrial reuse

Struvite & ammonium sulphate production

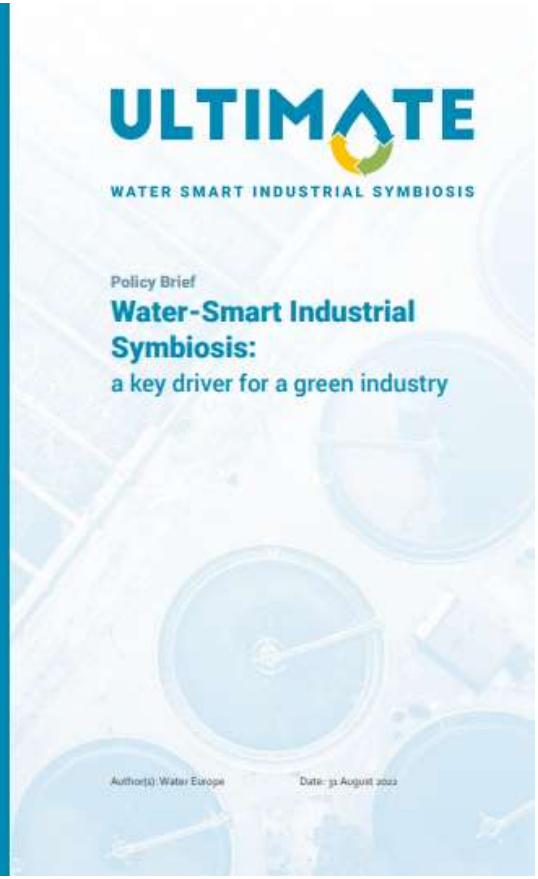


Reverse osmosis unit

Ultimate interventions

Low-cost energy for heating
Boiler
Biogas
Ww
Effluent
Pre-precipitation
Fertiliser
Ammonia
Concentrate
Discharge to the Dornoch Firth
Heat utilisation
RO membranes
Permeate
Heat utilisation
Stripping column and scrubber
AnMBR
Struvite
Barley fields
Cu rich sludge
Water reuse

Policy support for



Main Recommendations

- Adopt a risk-based approach for reused water and recovered materials in Europe.
- Encourage financial incentive for circular economy systems.
- Consider the opportunities of digital tools within the revision of the directive to support water-smart industrial symbiosis.
- Familiarise citizens with circular economy systems.
- Companies may provide a more transparent overview also of their non-circular activities.

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Final messages

- Water Smart Industrial Symbiosis (WSIS) is a special type of Industrial Symbiosis in which **water, energy and materials** from municipal and industrial wastewater **are recovered and reused**
- Successful circular transitions depend on **systematically addressing technological, digital, socio-economic, governance and business systems interdependencies**.
- Showcasing WSIS cases (in living labs) with emphasis on **cross synergies, transferability and applicability** of the concept may contribute to a further acceptance and understanding.

- **Transformation** of linear production-consumption-disposal chains in industrial processes to circular systems may reduce the vulnerability to climatic changes and environmental degradation and **contribute to a more competitive industry**.

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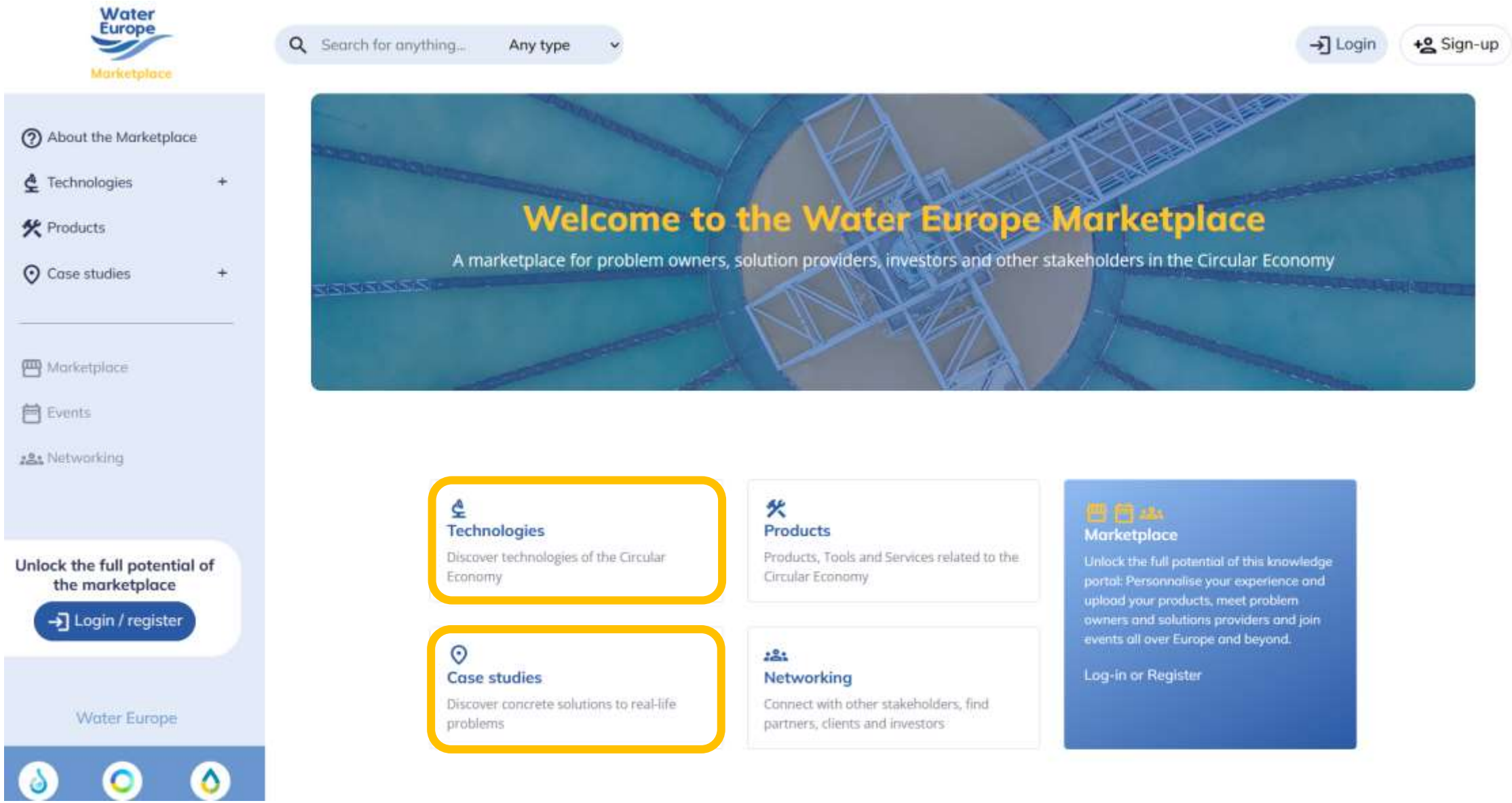
Water Europe Marketplace: Technology Evidence Base



KWR

Groningenhaven 7
3433 PE Nieuwegein
The Netherlands

T +31 (0)30 60 69 511
E info@kwrwater.nl
I www.kwrwater.nl

@KWR_Water KWR KWR_Water

Joep van den Broeke
Joep.van.den.Broeke@kwrwater.nl
+31 30 6069658

Gerard van den Berg
Gerard.van.den.berg@kwrwater.nl