



What do Trappist monks, a whisky distillery and water utilities have in common? How can water utilities and industries seamlessly exchange resources to future-proof their businesses? The answer lies in the Circular Economy.

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The need for a Water Circular Economy has become more evident and urgent in 2020. Traditional, linear supply chains involving production, consumption and disposal have become vulnerable. Climatic changes, commercial competition and environmental degradation are putting existing business models under strain.

While solving each of these challenges on their own is very difficult, what if we could help to solve all three problems at once?

Developing local, robust and transparent markets for water-embedded resources, including water, energy and materials, can help to climate-proof the whole of European society.

To unlock these resources and the benefits of water in the circular economy, there is a need for innovative technology, business and governance solutions. Furthermore, if stakeholders and citizens are engaged, it will accelerate not only the uptake but also the acceptance of circular solutions.

Rethinking and redesigning workflows

One expression being used to summarise the collaboration needed between differ-

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ent stakeholders and markets is “industrial symbiosis”. This describes utilities and industry, public and private sectors, seamlessly collaborating.

A water circular economy model promises lower costs, as well as new types of revenues, exploiting ‘waste’ management not only as a legal obligation but as a new business opportunity. Furthermore, rejuvenation of local, national and regional economic activity could help towards economic growth with low environmental impact: a truly green recovery.

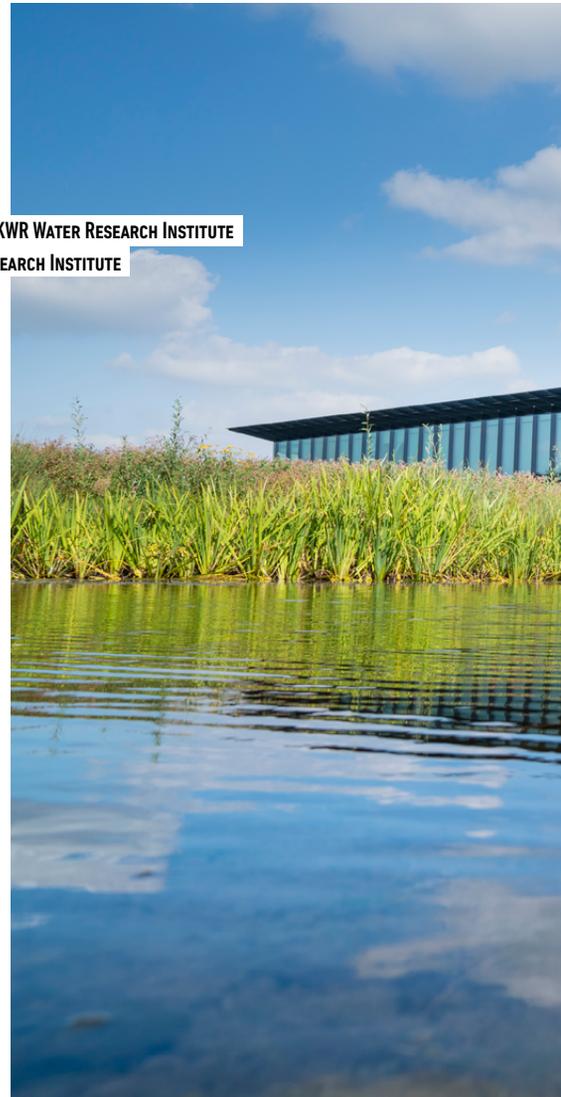
While industrial symbiosis and a circular approach can make industries future and climate-proof, the transition to get there is far from easy. To date, innovations in the domain remain fragmented. Small scale experiments are encouraging but the wider uptake is still missing.

In light of the progress needed, there is a critical mass of projects being assembled to really push the circular economy forward in the next few years.

Two exciting European projects, being led by KWR Water Research Institute in the Netherlands, are exploring how we can accelerate water circular economy ambitions and navigate the potential hurdles in our path.

Project ULTIMATE: increasing economic value and sustainability

A total of 27 project partners have come together under the ULTIMATE project (indUstry water-utiLiTy symbiosis for a sMarter wATEr society).



Co-financed by the European Commission, the four-year Horizon2020 project is being carried out under the EU Water in the Context of the Circular Economy programme.

Kickstarting in the summer, the ambition is to create economic value and increase sustainability by valorising resources with the water cycle. The project will help to catalyse water’s role away from being collected, treated and disposed of, into instead being a vector for energy and materials.

WATER CIRCULAR ECONOMY SOLUTIONS



Real-world, large scale demonstrations will be used to help build an evidence-base of industrial symbiosis applications. To help the transition to a circular economy, ULTIMATE will explore unlocking the following water-embedded resources:

- ★ (Waste)water: reuse at multiple scales, supported by advanced treatment technologies to produce fit-for-purpose water, compact/mobile/scalable systems, and where possible striving for near-Zero Liquid Discharge.

- ★ Energy: improved biogas production, water-enabled heat transfer, storage and recovery for allied industries and commercial sectors, combined water-energy management, treatment plants as energy factories.

- ★ Materials: nutrient mining and reuse, extraction of value-added compounds (e.g. antioxidants, precious metals), manufacturing new products from waste streams, and producing activated carbon from sludge to minimise costs of micro-pollutant removal.

Whisky to horticulture - 9 project partners

In total, nine large-scale demonstrations across Europe have been selected from

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Christos Makropoulos, Principal Scientist at KWR.



Gerard van den Berg, Coordinator of ULTIMATE.

the agro-food, petrochemical and biotech sectors. From water utilities to whisky distilleries, the partners represent a variety of stakeholders who could participate and benefit from circular economy activities.

In Tuscany, Italy, the Aretusa Consortium treats residue waters from two communities and has an ambitious vision to increase its annual water process capacity by 30 per cent.

Meanwhile, the famous Glenmorangie whisky distillery in Scotland aims to extract ammonia for usage as fertiliser and to recover heat for use in the distillery processes.

Furthermore, the project aims to reuse the water and nutrients after-treatment of the wastewater to remove pesticides

and plant pathogens. The goal is to achieve zero wastewater discharge.

NextGen: increasing economic value and sustainability

Another project being coordinated by KWR under the EU Water in the Context of the Circular Economy programme is NextGen. The four-year H2020 project brings together a partnership of 30 organisations to demonstrate technological, business and governance solutions for water in the circular economy.

Similarly to ULTIMATE, NextGen is addressing how the circular economy will be driven through a wide range of water-embedded resources, including:

★ **Water:** reuse at multiple scales supported by nature-based storage, optimal management strategies, advanced treatment technologies, engineered ecosystems and compact/mobile/scalable systems.

★ **Energy:** combined water-energy management, treatment plants as energy factories, water-enabled heat transfer, storage and recovery for allied industries and commercial sectors.

★ **Materials:** nutrient mining and reuse, manufacturing new products from waste streams, regenerating and repurposing membranes to reduce water reuse costs, and producing activated carbon from sludge to minimise costs of micro-pollutant removal.

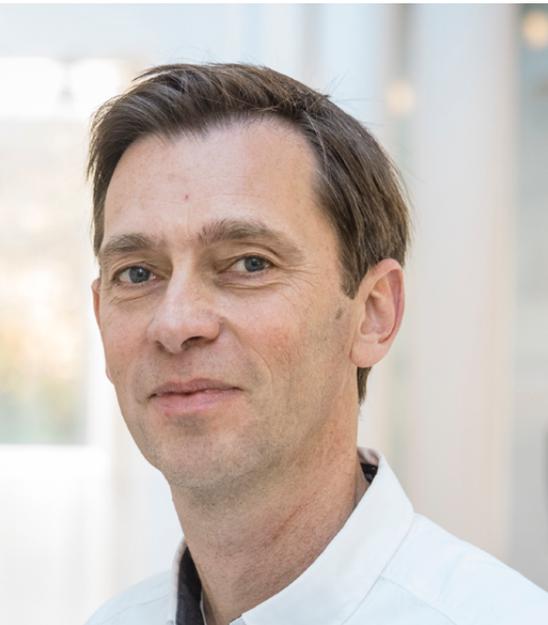
UK airfield to Dutch brewery - ten demo cases

Innovative circular water solutions are being demonstrated at ten large-scale sites across Europe. Emphasis will be on the conditions for successful application and upscaling.

Examples include in the UK, a former airfield north of Bristol is being developed into an attractive and sustainable area. As part of a masterplan, NextGen water and energy management will include a strategic Surface Water System, ensuring reliable drainage and allow local use of captured rainwater and water reuse.

Meanwhile, in the Netherlands, developments at the La Trappe brewery are enabling the recovery of carbon, nitrogen and phosphorus materials from wastewater. Furthermore, treated water is being reused primarily as irrigation

Two exciting European projects led by KWR Water Research Institute explore how we can accelerate water circular economy ambitions



Jos Frijs, Coordinator of NextGen.

water, and potentially as the water used during the bottle-washing process.

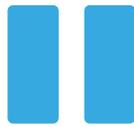
In the Costa Brava region in Spain, high seasonal demand can lead to frequent episodes of water scarcity, as well as causing saltwater intrusion. In light of this, the area is championing water reuse in Europe, with reused water being used for agricultural irrigation, environmental and non-potable uses.

A key innovation through NextGen is the regeneration of end-of-life membranes. Different molecular cut-offs will be used in the reclamation system, demonstrated through the operation of a pilot plant for two years.

From the UK to the Netherlands, Switzerland, Spain and other partners, it's expected that cross-fertilisation will occur during the course of NextGen, with key findings helping to develop an EU Roadmap to support wider uptake of circular solutions in the water sector.

Creating a smarter water society

By building bridges between science and practice, we can position water as the enabler in the broader context of the Water-Energy-Food nexus.



In total, nine large-scale demonstrations across Europe have been selected from the agro-food, petrochemical and biotech sectors



Resource-efficient solutions linking water treatment to industries, at scale, will help to build experience, knowledge and momentum



We need to rethink and redesign workflows, processes and business models, including governance and shareholder participation. Resource-efficient solutions linking water treatment to industries, at scale, will help to build experience, knowledge and momentum.

In doing so, we can create local, non-relocatable direct and indirect jobs,

as well as local economic development for European territories. This will help to future-proof European industries, climate-proof European society and safeguard the environment.

Leading the Ultimate and Nextgen projects, KWR is at the forefront of scientific solutions to global water issues, both nationally and internationally.