

## WATER SMART INDUSTRIAL SYMBIOSIS

# **CS2 – Nutrient Recovery**

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### **REUSE WATER**

Recover, refine & reuse wastewater from industries & municipalities

### EXPLOIT ENERGY

Extract & exploit energy, combined water-energy management, waterenabled heat transfer, storage & recovery

#### **RECOVER MATERIALS**

Nutrient mining & reuse, extraction & reuse of high-added value exploitable compounds

## *"Water Smart*

Industrial Symbiosis"

## 9 DEMOSITES

ULTIMATE will implement Water Smart Industrial Symbiosis in nine large-scale business cases from the international agro-food, petrochemical and biotech sector.

#### 

2- Nieuw Prinsenland (NL)
3- Rosignano (IT)

⊕ 4- Nafplio (EL)

⊕ 5- Lleida (ES), Ostrava (CZ)

8- Saint-Maurice l'Exil (FR)
9- Kalundborg (DK)





# Horticulture – Industry symbiosis

- Greenhouse development in the Netherlands
- Builds upon existing symbiosis and collaborations
- Project partners involved







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



# **Fate of Nutrients**

- Pesticides and pathogens removed with advanced treatment
   reclaimed greenhouse wastewater will contain valuable nutrients
- Effects of nutrient composition in the reused water on plant growth and health (e.g. Na/K ratio) will be assessed in the demo-greenhouse.
- Optimum nutrient balance and prevent the accumulation of specific minerals (B, Cu, etc.)
- Economic analysis of potential cost savings by using recovered nutrients







## **Timeline**

S.no.	Coop Study 2	2020									2021										2022						
	Case Study 2	6	7	8	9	10 5	11 6	12 7	1	2	3 10	4	5 12	6 13	7	8	9 16	10 17	11	12 19	1 20	2	3 22	4	5 24	6 25	7
1	Defining the case study and demonstration site	KWR					Ū				10			10			10		10		20			20	21		
2	Detailed literature review of technologies for greenhouse drainwater reuse	KWR																									
3	Proposed pilot site baseline (data collection)	KWR																									
4	Definition of workplan (MS5)	KWR																									
5	Designing an experimental plan and setting up laboratory equipment	KWR																									
6	Bench scale experiments and system optimization	KWR																									
7	Assessment of achieved reuse safety (water quality and microbiological)	KWR																									
8	Selection and scaling up the technology to pilot scale and site adaptation (MS9)	KWR																									
9	Designing prototype for construction	KWR																									
10	Prototype installation at the pilot site	KWR																									
11	Operating the prototype technology at the pilot site, data collection, data analysis and	KWR																									
12	Pilot monitoring, results, follow-up and scenario comparison (MS19)	KWR																									



# **KWR and Nutrient Recovery**

- Nutrient recovery as part of resource recovery
- Resource recovery from drinking water production
- In cooperation with Aqua Minerals → company that sells resources from water and wasewater
- Calcite in face scrub
- Ferric (hydr)oxide pellets for removal of sulphur from (bio)gas, phosphorus from (surface) water and arsenic from (ground)water





Sach



# **KWR and Nutrient Recovery**

- Nutrients from wastewater
- Metals: heavy metals are rare earth metals from fly ash
- Biogas from slaughterhouse wastewater

- Core project:
- Liquid fertilizer production







# **KWR and Nutrient Recovery**

Resources from drinking water production and industry for application in wastewater treatment

• Spent powdered activated carbon from industrial use for OMP removal from WWTP effluent

Reuse of greenhouse drain in greenhouses: project in Nieuw Prinsenland to determine theoretical safety of reuse: microbiological and pesticides

Reuse of municipal effluent for greenhouses: treatment for upcycling, regulations, risk analysis and monitoring throughout the whole chain for responsible reuse: from WWTP to greenhouse to table





## **Thank You!**

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