

# WP7 Evaluation of ZERO BRINE systems sustainability performance

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## Introduction

- 1. Where are we in WP7
- 2. D7.3 Results of preliminary analysis
- 3. Next steps





# **1. Where are we with WP7?**

### • Task 7.1 - Evaluation LCA, LCC and Social

- Design workshops
- Data collection
- Draft D7.3 Preliminary Analysis delivered 1<sup>st</sup> June 2019
- Task 7.2 Feasibility study
- Task 7.3 Environmental Technology Verification
  - Workshop today





#### Task 7.1 Stages in "Unified Approach for Sustainability Evaluations"

Final analysis start: Mar 2020 Data collection end: Sep 2020?



Finalise evaluation. Includes:

- Updated data collection for optimised process
- Update and finalise LCA/LCSA/LCC evaluation





### D7.3 Preliminary LCA and LCC – *Overview of results* Demineralised Water Plant – Netherlands *Life cycle assessment*

- ZB plant has higher impact
- However impacts of current discharge is not yet included
- Largest impact: chemical use at the TOC removal process
  - Sulphuric acid and sodium hydroxide
  - Due to electricity in production
- Benefits of recovery of water, NaCl and magnesium do not counteract the impact of the chemicals







### D7.3 Preliminary LCA and LCC – *Overview of results* Demineralised Water Plant – Netherlands *Life cycle costing*



#### OPEX estimations of DWP with ZB system



Contributions of consumables and recovered materials



# Case study 2: Coal mine, Poland Main findings



Conf. 1: Two stage NF, electrodialysis diluate recycled to NF



Conf. 2: Single-stage NF, ED diluate recycled to NF

Best environmental performance with similar LCA results

Industrial Wastewater 

Resource Recovery 

Circular Economy



- Main environmental impact: (i) energy consumption, (ii) use of dolime suspension at the magnesium recovery process.
  - Minor: Use of the auxiliary materials for cleaning and regeneration purposes
- Positive benefit: Recovered materials especially magnesium hydroxide (dependent on quality)
- LCC performance: Positive LCC results up to 1.022,75 €/ m3 wastewater
  - From the 4<sup>th</sup> configuration (single stage NF, 75% NF retentate recycling, ED diluent recycling before RO) is the most cost-effective one (no externalities included)



# Case study 3: Textile Industry, Turkey **Preliminary results**

- Main environmental impact: Reverse Osmosis from energy consumption. RO contributes most to all impact categories, with a factor of higher than 80%, except ozone layer depletion.
  - **Minor**: Use of auxiliary materials (mainly cleaning and operational chemicals)
- **Positive benefit**: Recovery of materials and especially brine solution (quality and market dependent)
- LCC performance: LCC result is positive at 403,62 €/m3 wastewater input, (externalities not included)





# D7.3 Preliminary LCA and LCC – Overview of results Silica Plant - Spain

- RO main cause of environmental impact (80%)
- Physico-chemical treatment 10%; UF 5% (from operation, and energy use)
- Regenerated membranes only 5-10% impact v new membranes
   LCC
- OPEX 80% / CAPEX 20%
- Staff account for 60% of OPEX (>50% of total)



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## 3. Task 7.2 Feasibility study

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- Feasibility Study Economic evaluation of case studies examined - Ecodesign for fullscale development
- DLR will use the simulation platform developed in Task 5.3 to obtain concrete figures about energy and mass balances, as well as critical cost figures regarding the operating costs (OPEX).
- Example → Evides I (flowsheet & RCE implementation)
- Main results provided till 06/2020



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- Task 7.1
  - LCA/LCC data refinement and collection from pilot plants
  - Unified Approach nearing completion
  - Refine analysis
- Task 7.2: Feasibility
  - Completed by June 2020
- Task 7.3 Environmental Technology Verification
  - Agree plan forward
  - Data format and collection





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# Can LCA be used for design?

- Absolutely !!
- It can help with many questions
  - Materials and energy impacts from mining
  - Performance during the use phase
  - What is the best option at the end of life?
- Life cycle costing
  - Can give a new perspective
  - Help to show benefits







#### Normalisation ILCD, Configuration 1

