Run4Life

Recovery and Utilisation of Nutrients 4 Low Impact Fertiliser

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LEITAT
managing technologies

European Geosciences Union
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RUN4LIFE

A change is needed

- Domestic wastewater is an important nutrient carrier
  - Currently not exploited – nutrients are wasted

- Run4Life demonstrates a necessary change, with nutrient recovery at the source in a decentralised approach from segregated flows
  - Black water (BW), kitchen waste (KW) and grey water (GW)

- Innovative technologies for enhancing nutrient recovery are integrated with near-market complementary fertiliser concepts

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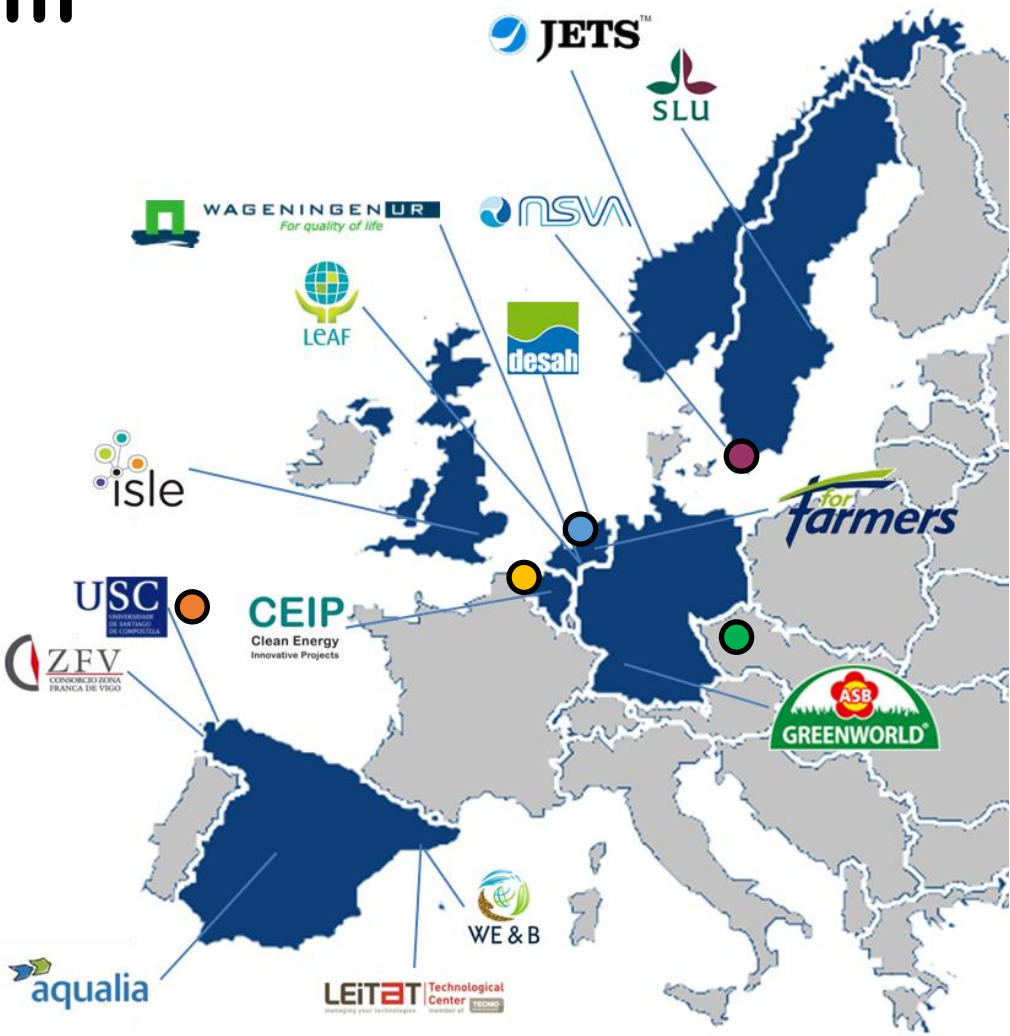
Run4Life consortium

Demonstration sites:

- Sneek, the Netherlands: 32 homes
- Vigo, Spain: 3 office buildings
- Ghent, Belgium: 120 homes
- Helsingborg, Sweden: 320 homes
- Czech Republic: large industrial area (possible replication site)

15 partners
Start Date:01/06/2017
End date: 31/05/2021
EC Contribution: 6.239.340



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Ambition

Potentially recycling up to 100% of the nutrients present in household WW and organic KW (N, P, K and micronutrients)
Recovering >90% of GW as reclaimed water
Energy Positive and Carbon Neutral

Nutrient recovery processes can be tailored to specific local priorities and will be slightly varied to adapt Run4Life to local conditions and requirements

Break barriers to implementation: **market uptake of products and social acceptance,**

Necessity of further developments in technological, legal and end-user aspects.

Objectives

- Improve innovative nutrient recovery technologies
- Demonstrate large scale nutrient recycling from domestic wastewater
- Evaluate impacts on environment, society and economy
- Promote full acceptance of recovered products, review legal framework
- Implement value chain for recovered products, incl. new business models

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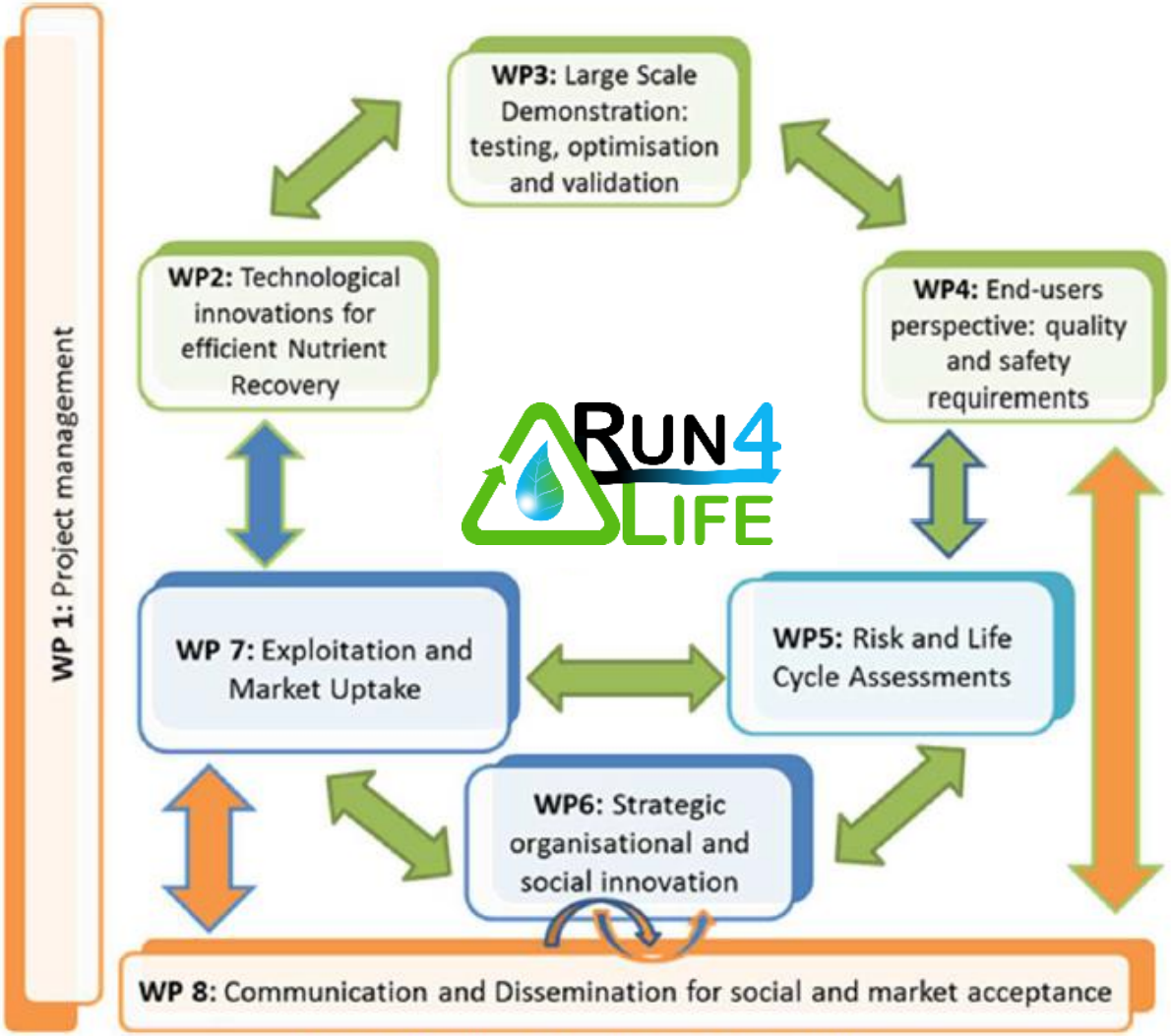


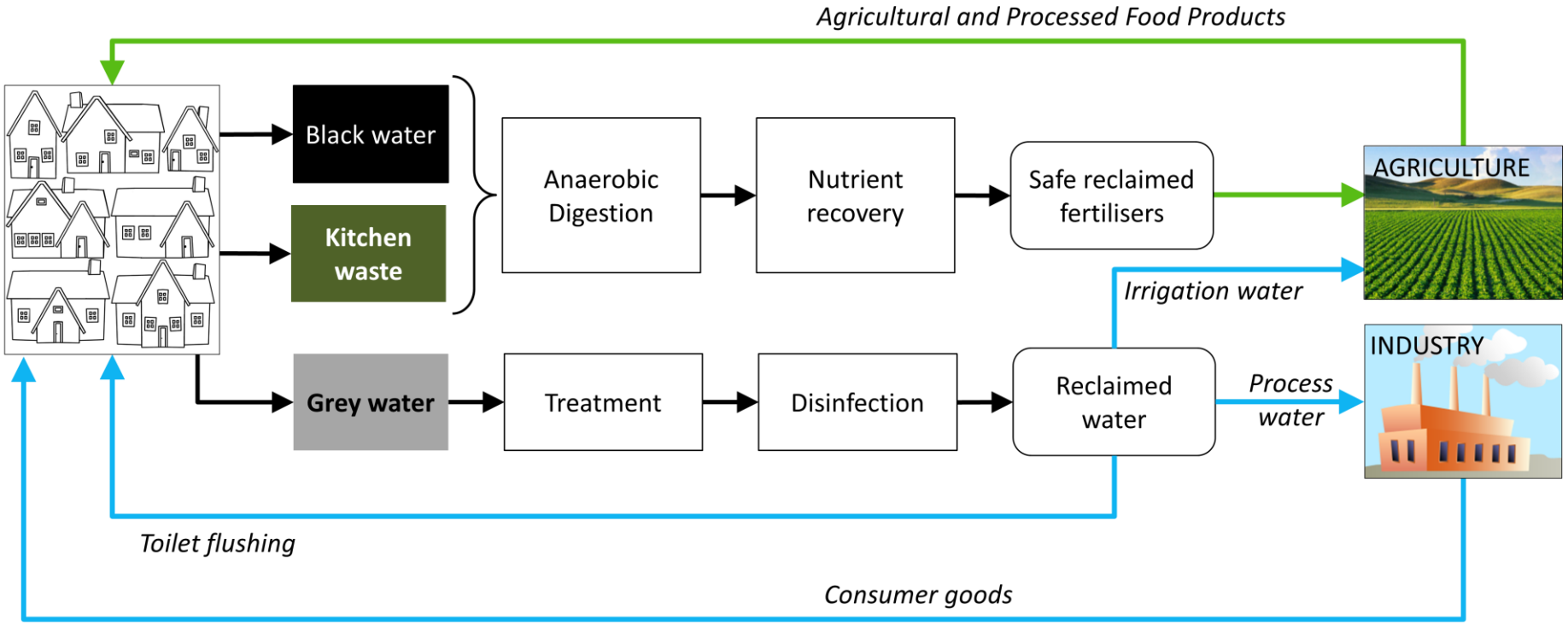
Figure 20. Pert diagram of Run4Life.

General technological concept

Black water (BW) comes from toilets, mainly containing faeces and urine. It presents the majority of the P and N in household WW, which can be recovered as highly valuable fertiliser products.

Grey water (GW) comes mainly from shower and laundry activities. Its low nutrient concentration makes more suitable for reuse and obtaining reclaimed water.

Kitchen waste (KW) contains a high percentage of the domestic-generated P and N, as well as most of the organic material in a relatively small volume.



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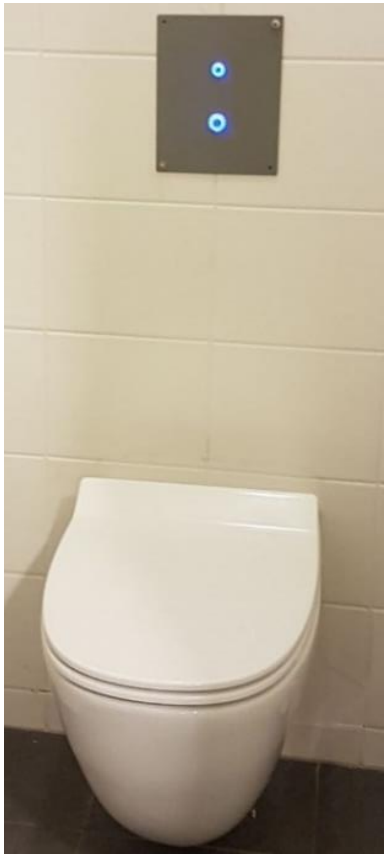
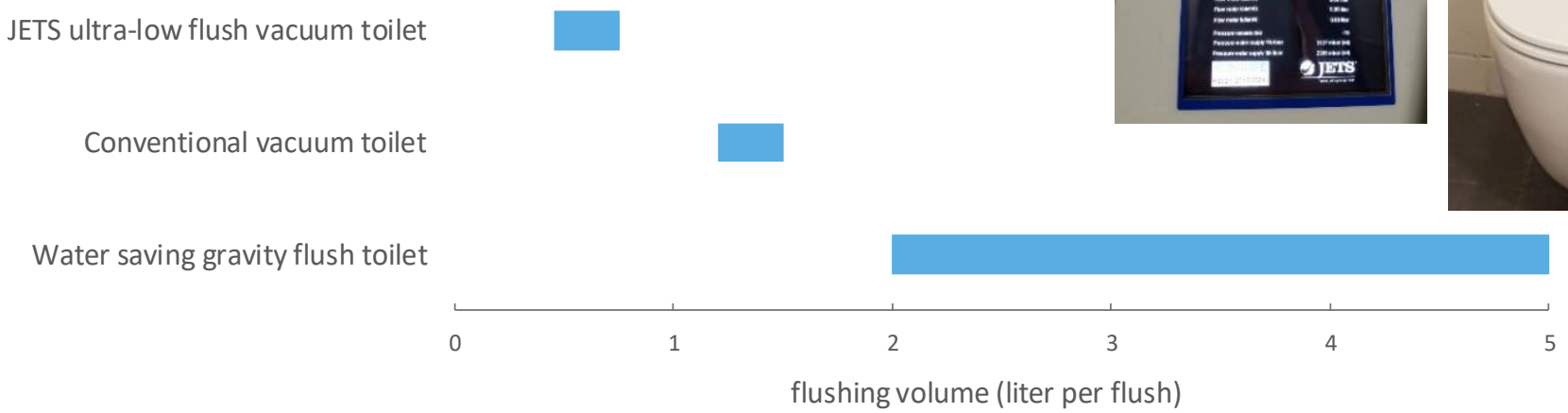
Nutrient-recovery Technologies developed by R4L

Ultra-low flush vacuum toilets

- The novel ultra-low flush vacuum toilet developed by JETS works with a flushing water volume of 0.4-0.7 liter
- Compared to traditional water saving toilets a substantially lower water consumption and higher nutrient concentration in the blackwater is achieved.





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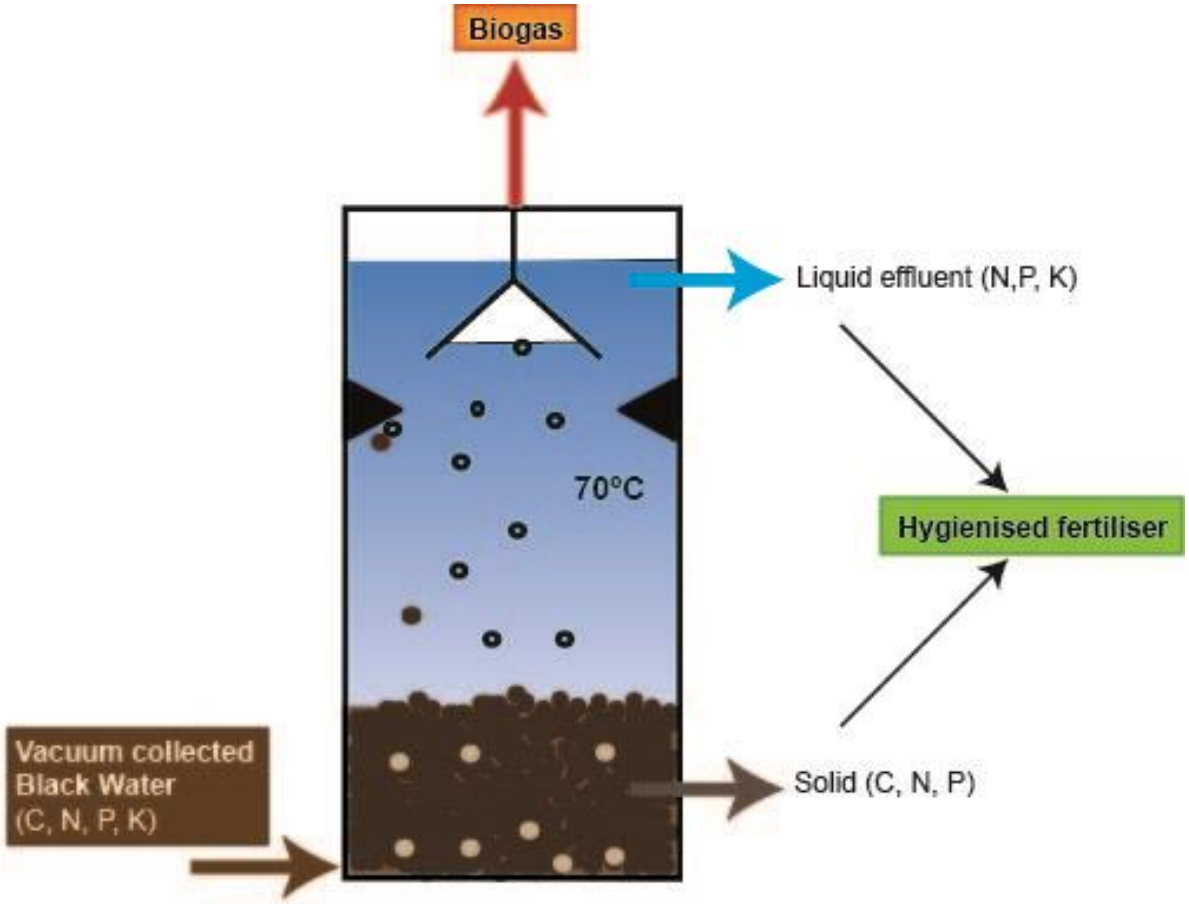
Nutrient-recovery Technologies developed by R4L

Hyper- thermophilic treatment (HTAD)



Hyper-thermophilic anaerobic digestion of concentrated black water:

- One-step treatment
- Aims to recover the phosphorous and nitrogen in the hygienised effluent
- Ready to use as fertiliers

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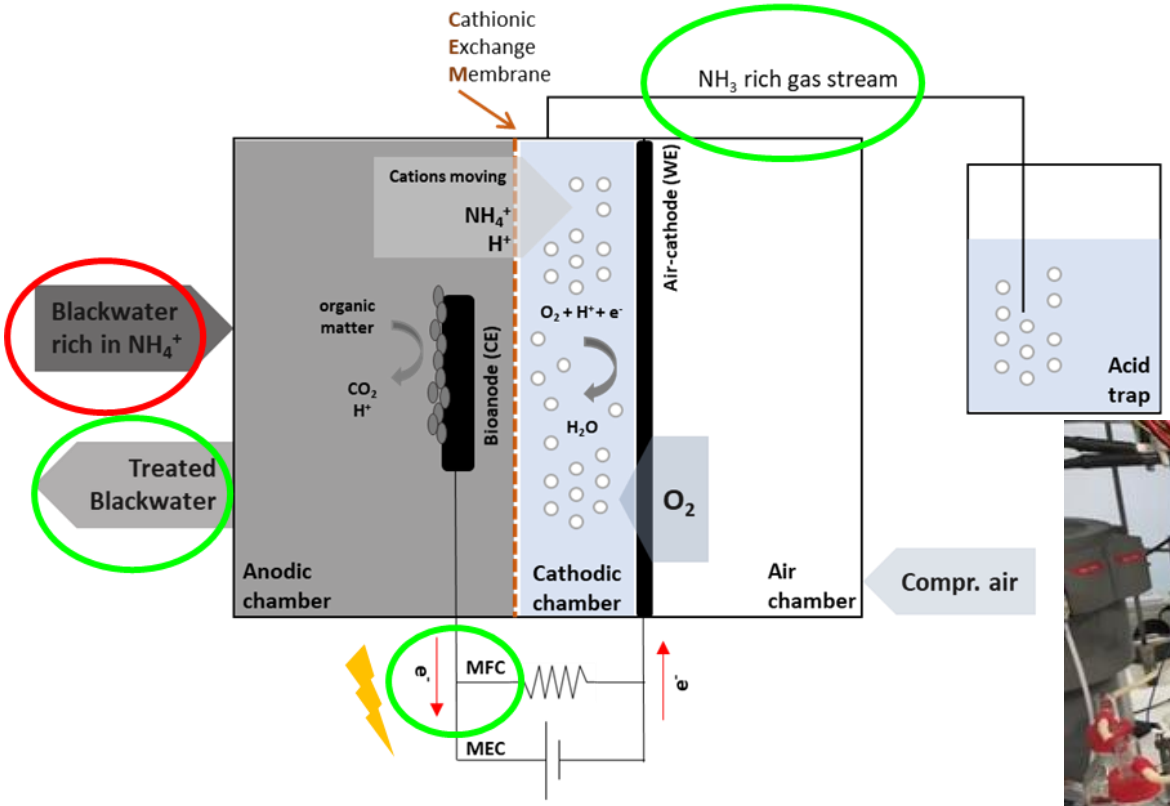
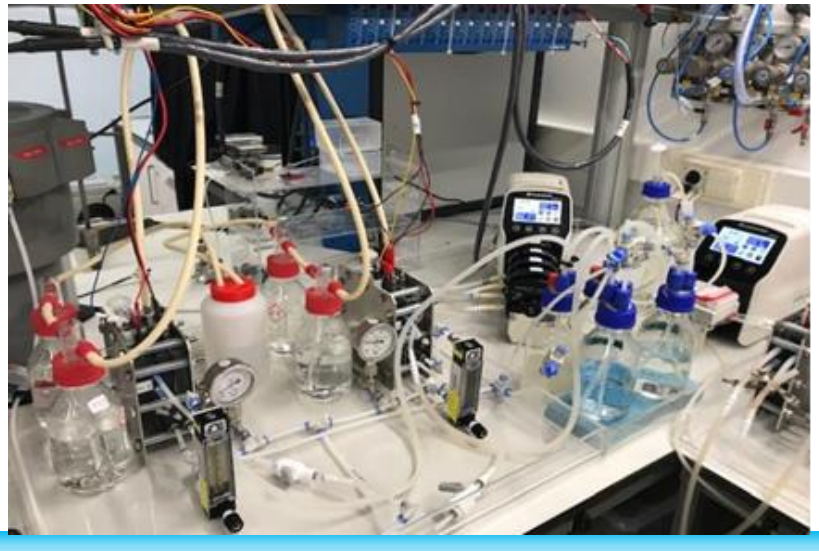
Nutrient-recovery Technologies developed by R4L

Bio-electrochemical systems (BES)



BES recovers up to **12,8 g/m2** of nitrogen present in blackwater as liquid fertilizer **(ammonium nitrate)**



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Run4Life Demonstration sites

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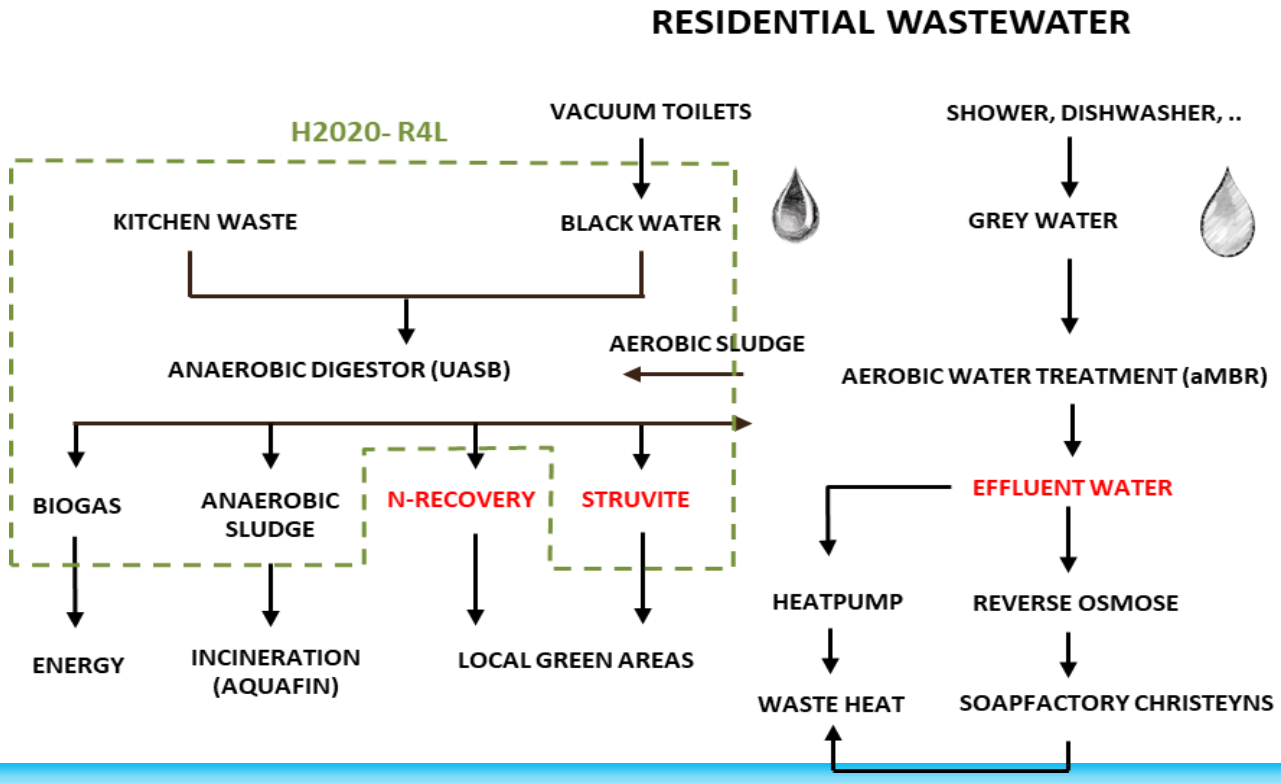
Demonstration site at Ghent, Belgium

Ghent, Belgium

» Segregated black water+ kitchen waste will be processed in an anaerobic system. Grey water will be treated in a system not included in Run4Life.

» Recovery of struvite and phosphoric acid.

120



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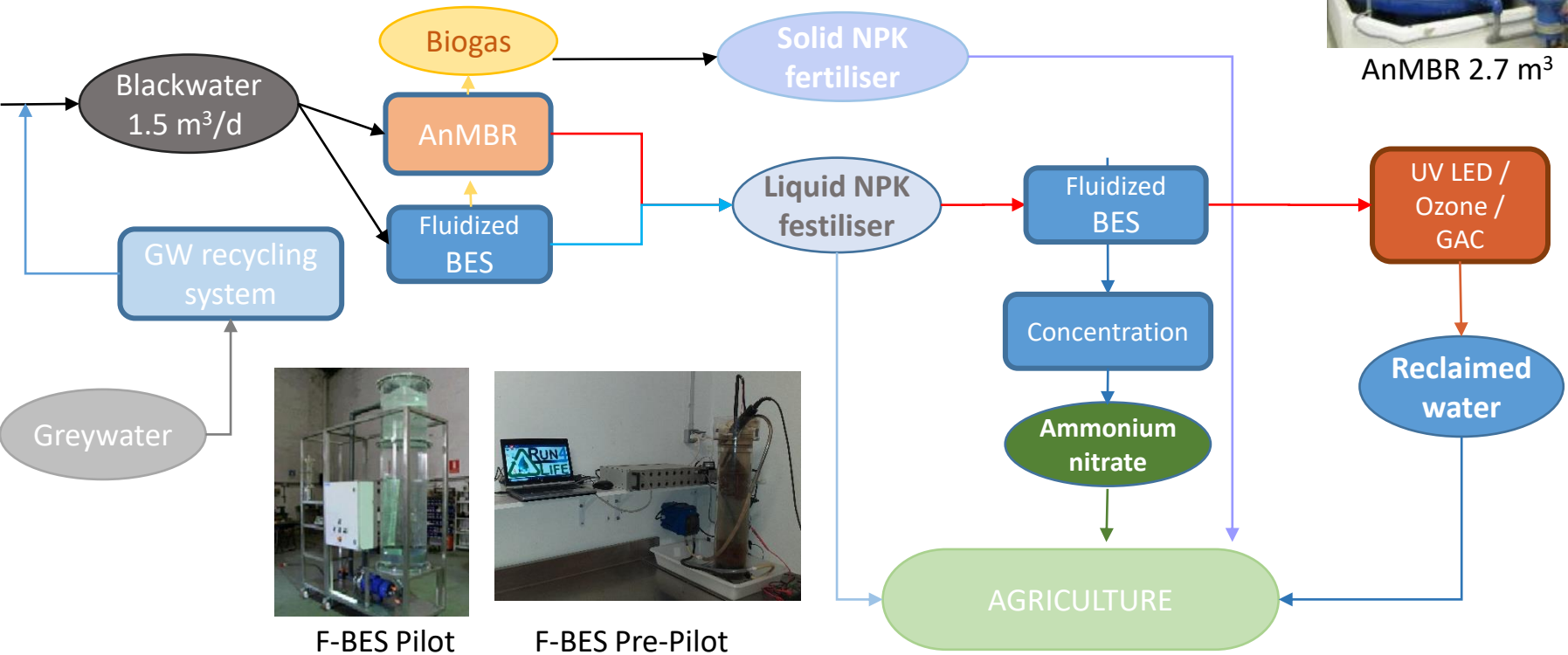
Demonstration site at Vigo, Spain

Vigo, Spain ☑ 3

- » Grey water recycling system (already present): effluent for toilet flushing.
- » Black water treated in anaerobic MBR (compared to aerobic MBR).
- » Anaerobic effluent processed in innovative nutrient recovery technologies e.g. bio-electrical systems, recovery of ammonium nitrate and struvite.
- » Integrated value chain with online monitoring tool.

AnMBR 2.7 m³



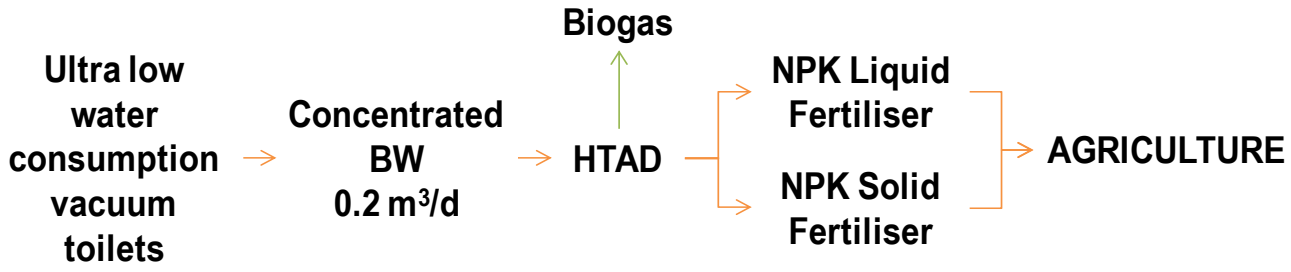
F-BES Pilot reactor: 450 L

F-BES Pre-Pilot reactor: 5.4 L

Demonstration site at Sneek, the Netherlands

Sneek, The Netherlands ☑ 32

- » Ultra low flush vacuum toilets for production of concentrated black water.
- » Hyper thermophilic anaerobic digestion at 70°C aimed at obtaining safe fertilisers in a one-step energy positive treatment.
- » Recovery of hygienised organic liquid and solid (NPK) fertilizer.
- » Optimisation of product recovery in cooperation with fertilizer company.



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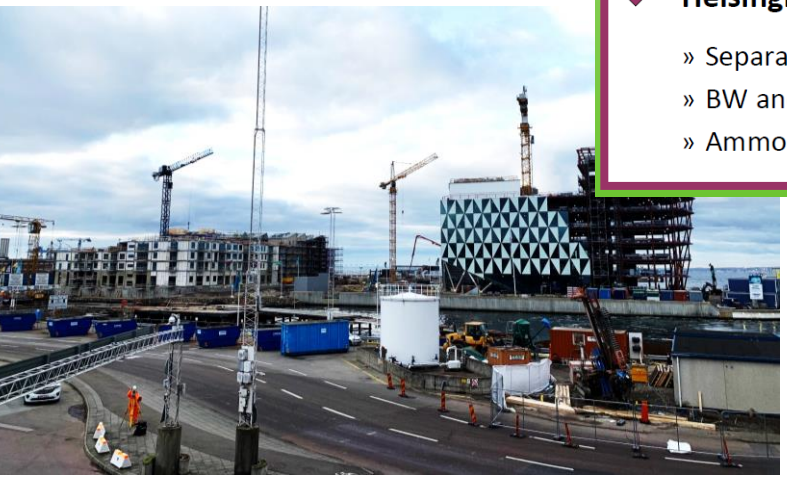
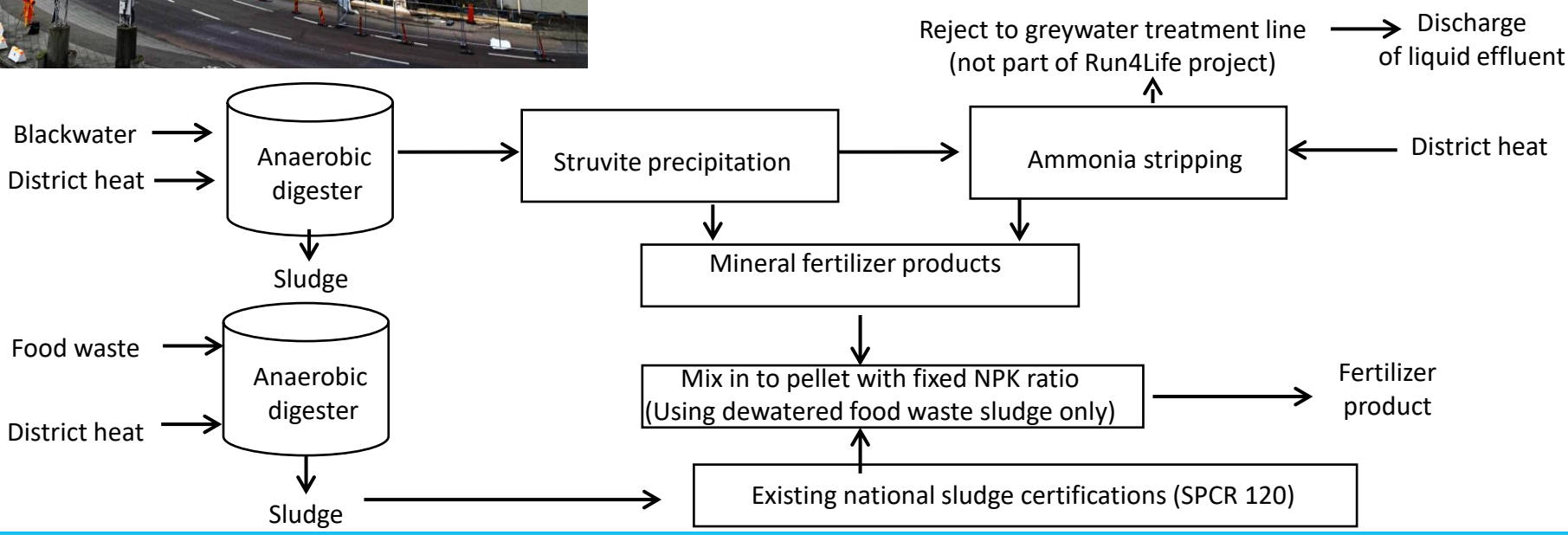
Demonstration site at Helsingborg, Sweden



Helsingborg, Sweden

- » Separate treatment of black water and kitchen waste
- » BW and KW will be treated in an anaerobic system for energy recovery
- » Ammonium sulphate and struvite will be recovered

320



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How does Run4Life test quality and safety of the fertilizers and technologies to obtain those?


Pot tests


Field trials


Risk assessment


Life cycle assessment

How does Run4Life maximize the impact beyond the lifespan of the project ?


Social acceptance analysis


Communication & dissemination activities


Exploitation and Market uptake analysis

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Run4Life will make possible the transition to a Circular Economy of nutrients incorporating four dimensions economic, social, legal and environmental

Impact 1. Decreasing the dependency on primary nutrient resources and increasing European supply security

Impact 2. Reducing the adverse effects of nutrient emissions on the environment

Impact 3. Closing the water and nutrient cycles in the whole production and consumption value chain

Impact 4. Improving data quality on nutrients flows, to favour investments into recycling of recovered nutrients

Impacts 5&6. Creating new business opportunities in the EU, to generate new green jobs and export industries around nutrient recovery and recycling, Contributing to the exploitation of EU innovative solutions in the global market

Impact 7 & 8. Improving the policy and market conditions in Europe for large scale deployment of innovation. Providing evidence-based knowledge regarding the enabling framework conditions that facilitate a broader transition to a Circular Economy in the EU.

Find out more about Run4Life