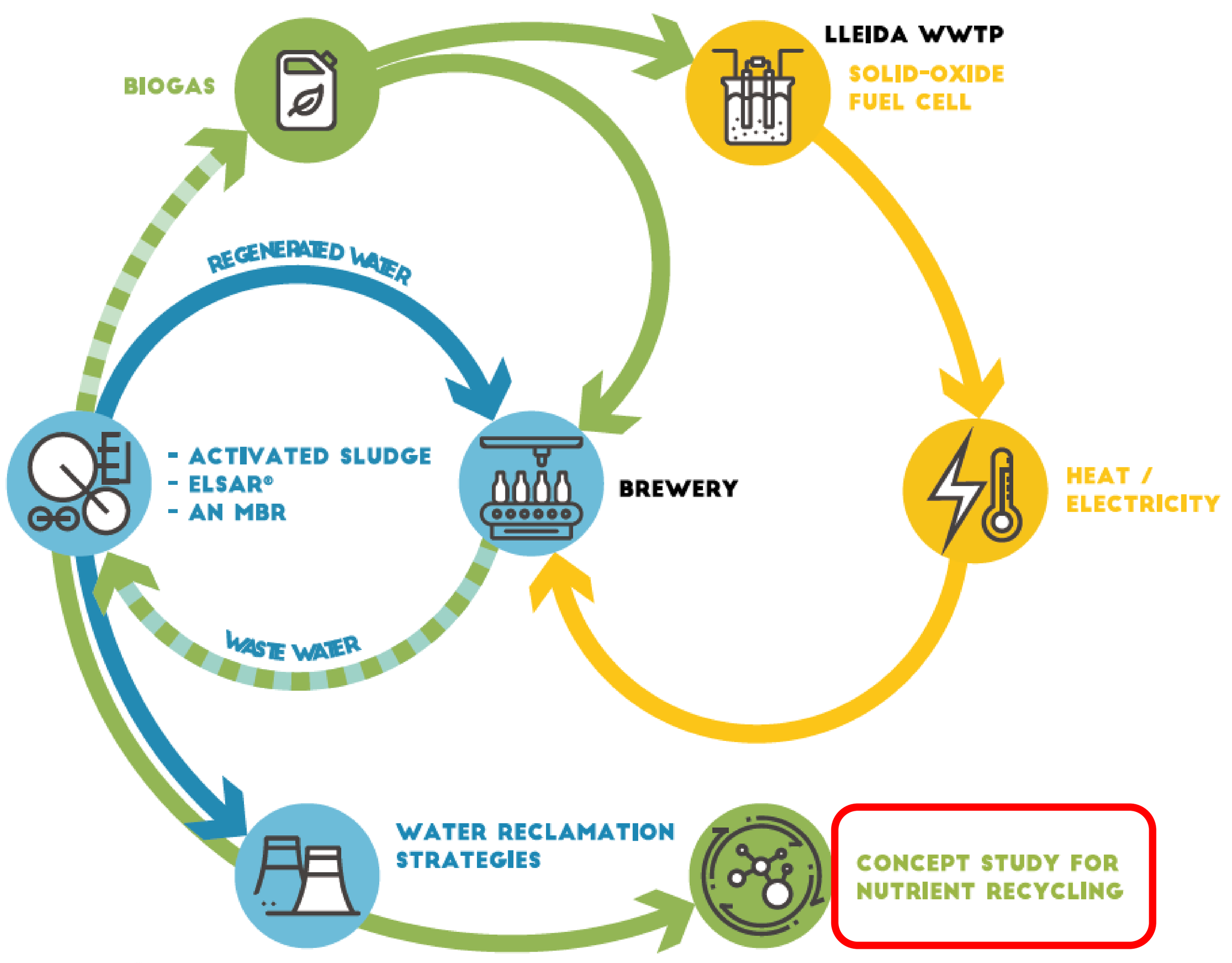
ULTIMATE

WATER SMART INDUSTRIAL SYMBIOSIS

TRANSITION FROM LINEAR TO CIRCULAR ECONOMY

in the nexus of the water sector & intensive water consuming industries.

CS5 – Recovery of nutrients & sludge solutions

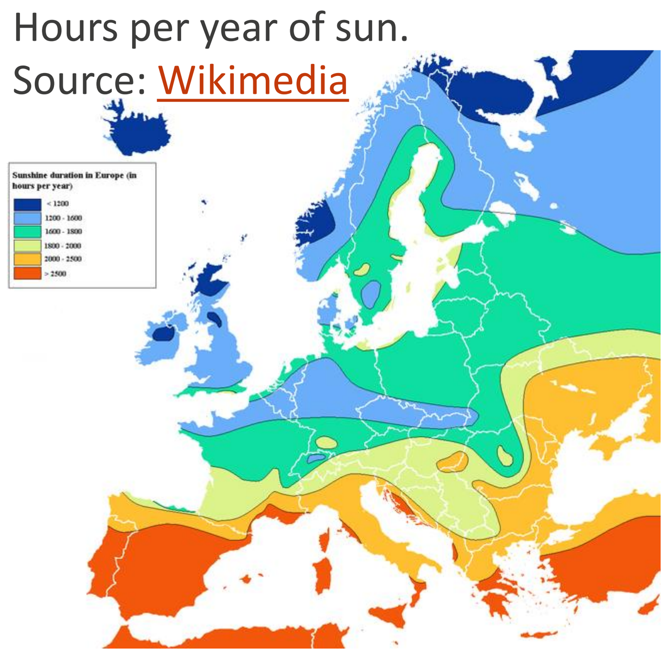


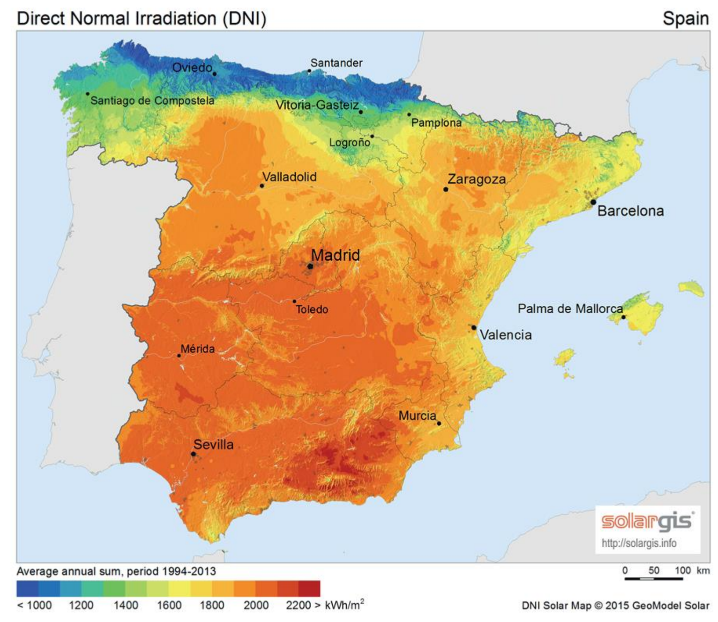
aqualia HIDROTEC TECNOLOGIA DEL AGUA SmVaK

Motivations

- Coming sludge sanitation regulation
- Improve biogas productivity via hydrolysis
- Reduce water in final sludge for less management costs
- Reduce carbon footprint in sludge treatment
- Carbon fixing
- Develop competitive technology by means of intensification of sun energy

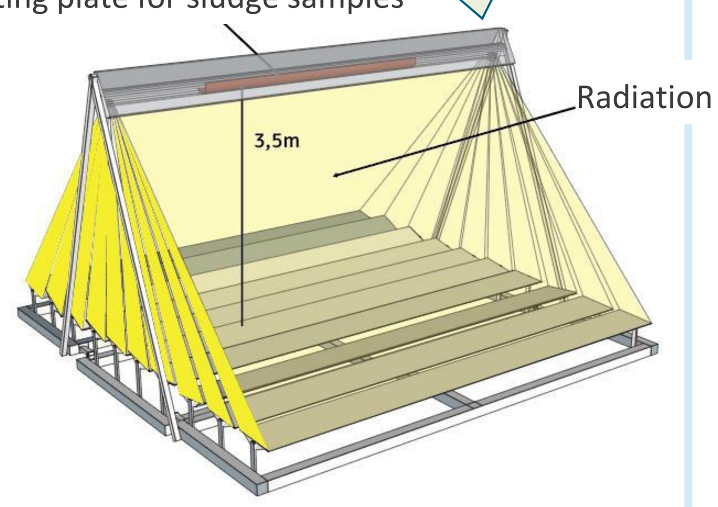
Hours per year of sun.
Source: Wikimedia





Reactor features

- Supplied power 14,5 kWt
- Net mirror surface 26,4 m²
- Monitoring of energetic production & climatic data
- Self-orientation of mirrors
- Remote visualization



Objectives

TRL: 5 → 6

- Development of a novel concentrated solar-based technology, able to reproduce known thermochemical processes on sludge (hydrolysis, sanitation, drying or hydro-thermal carbonization (HTC)), providing a sustainable, safe and low-cost solution for sludge treatment.

TRL: 5 → 7

- Concept study for nutrient reclamation (by means of struvite & hydrochar) in a real municipal WWTP and a real industrial WWTP

First results. Proof of concept & preliminary works

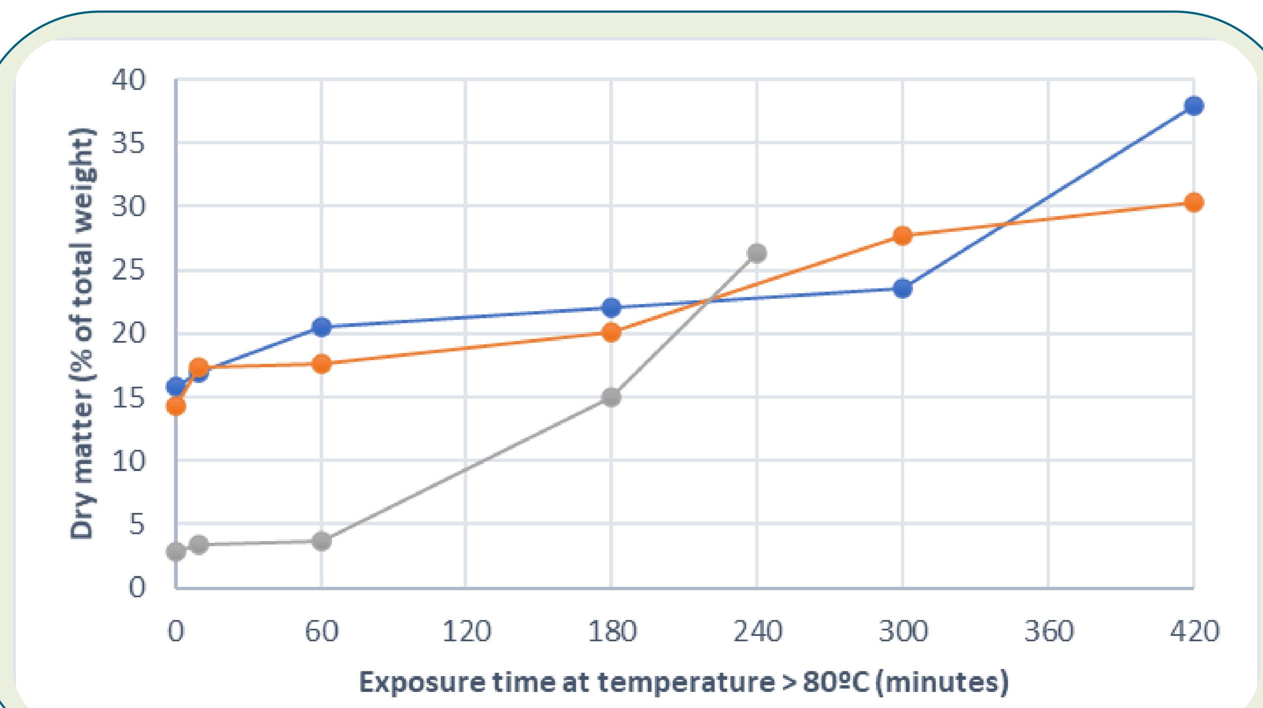
→ Temperatures above **100ºC** were achieved for 7 hours, under constant climatic conditions.

→ Batch tests on dewatered sludge and on thickened sludge, respectively showed dry matter content increased between **2 and 9-fold** after 7 and 4 hours under constant solar exposition at 80ºC.

→ Results regarding pathogen inactivation or hydrolysis extent are still under development.

→ Locations and recoverable materials for the concept study were defined, according to its tecno-economic feasibility in terms of integration in FCC Aqualia.
  → **6 Tn P/a** are potentially available for extracting **struvite or vivianite** in a municipal WWTP.
  → **600 Tn dry sludge/a (brewery) & 1600 Tn dry sludge/a (urban WWTP)** are potentially available for extracting **hydrochar** by means of hydro-thermal carbonization.

→ Possibilities of extracting recoverable materials from other industrial potential sources (ex. spent grain, yeast) are under estimation.



Lessons learned from the construction and start-up

→ Direct irradiation of sludge may be considered as a low-cost solution for drying or sanitize sludge, but the limitations need to be well understood, like the meteorological conditions throughout the year and the limited solar daily time.

→ Struvite and hydrochar are interesting, but regulatory requirements can conditionate its implementation.

What is crucial in terms of replication of the technology?

→ Further development for continuous-mode operation

→ A realistic comparison (in terms of CAPEX, OPEX, ROI, carbon footprint or LCA) of the solar-driven plant vs. each conventional thermochemical solution.

→ Legal—risk assessment for recoverable materials

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