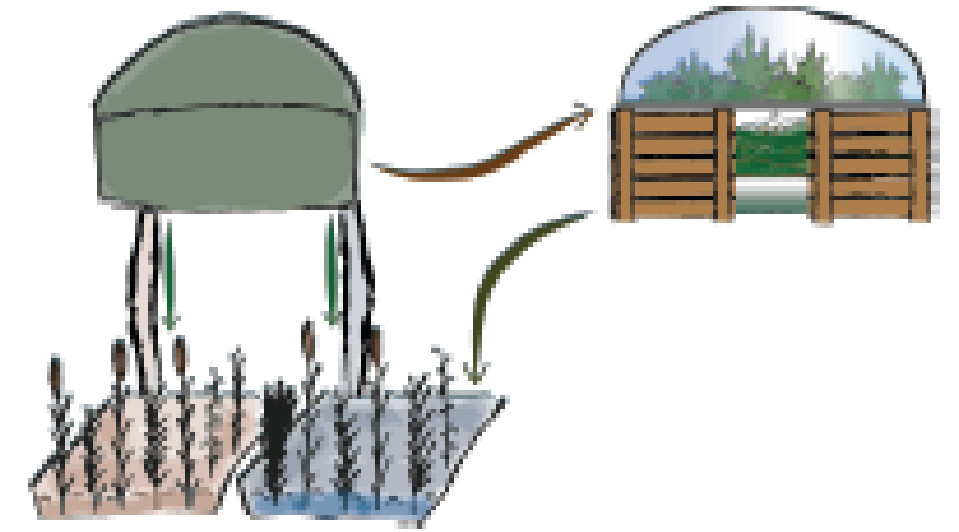




HYDRO 1

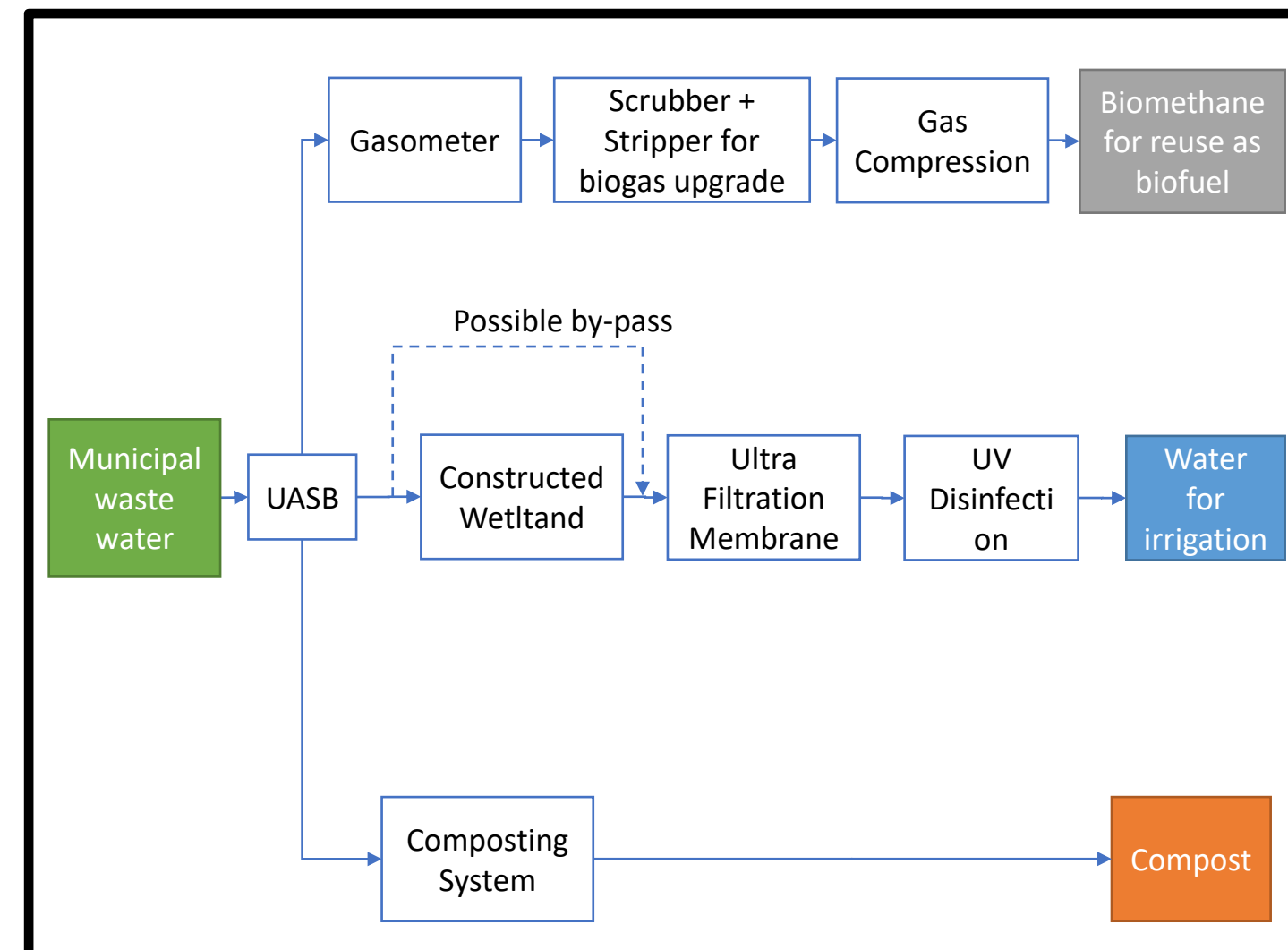
a sewage treatment system applied in decentralised areas with high seasonal loads to recover energy and recycle water and nutrients

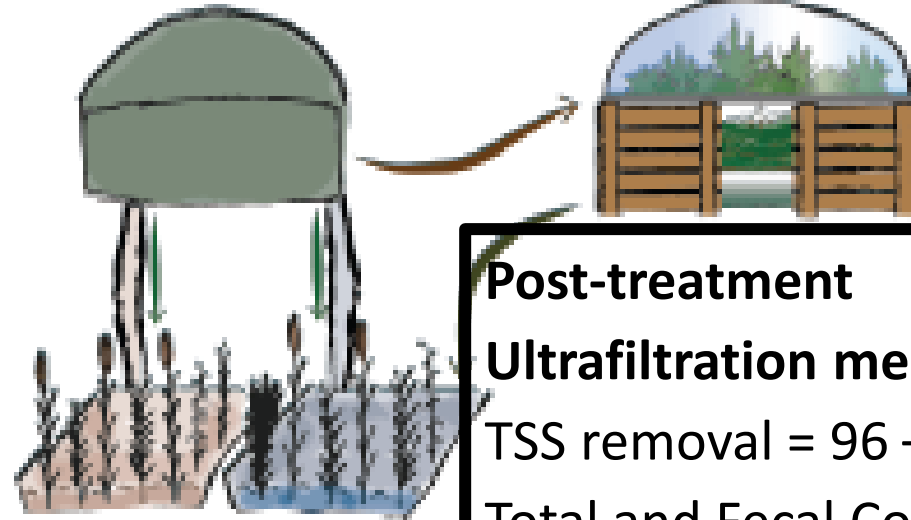


System Description

HYDRO1 consists of a sewage treatment system applied in decentralised areas with high seasonal loads. HYDRO1 combines anaerobic processes (Upflow Anaerobic Sludge Blanket (UASB) reactor) with constructed wetlands and disinfection to treat domestic wastewater as a completely circular solution, where water, nutrients and the produced sludge are going to be reused. Furthermore, the anaerobic process recovers energy in the form of biogas.

HYDROUSA establishes the optimal operating conditions under which organic load removal and biogas production are maximized. The excess sludge from the UASB gets mixed with biomass and co-composted in an innovative in-vessel composting system, coupled with a novel plant biofilter to treat the odours. According to legal constraints the UASB effluent will be either treated in a series of saturated and unsaturated constructed wetlands (CWs), filtered and disinfected for reuse in agriculture, or will be directly used for fertigation after disinfection. The produced biogas may be used for energy production in CHP generators or can be upgraded to methane to be valorised as a fuel. A simplified layout of HYDRO 1 is shown in Figure 1.





Technical Specifications

UASB

Pretreatment requirements: grease and grit removal

Municipal wastewater temperature range = 15–35 °C

Hydraulic Residence Time = 7 – 10 h

Organic loading = 2 - 10 kgCOD/m³/day

Area required = 0.25 m² per m³/day of wastewater treated

Upflow velocity = 0.5–1 m h⁻¹

Organic pollution removal as COD = 70 – 80%

Solids removal as TSS = 70 – 80%

Biogas/energy production = 0.24 m³ biogas per m³ of wastewater treated

Sludge production = 25 g DS per m³ of wastewater

Post-treatment

Ultrafiltration membrane

TSS removal = 96 – 99%

Total and Fecal Coliforms reduction = 3 – 6 log

Rate of flux = 60 – 180 l m⁻²h⁻¹

Energy consumption = 0.2 – 0.3 kWh m⁻³ of wastewater treated

UV Lamp

Estimated lamp life = 8000 – 12,000 hours

Max Energy consumption = 0.03 kWh m⁻³ of wastewater

Constructed Wetlands

Area required = 8.5 m² per m³/day of wastewater treated

Organic pollution removal as COD = 90%

Solids removal as TSS = 75%

Nitrogen removal = 10-20% (one stage wetland);

50-70% (two-stage wetland)

E. coli removal = 90 – 99%

Sludge production = none

Benefits

No wastewater discharge into the sea at dry weather

High quality wastewater effluent that meets Directive 91/271 effluent criteria

Cheaper Production of reclaimed water for restricted and unrestricted irrigation

Recycling nutrients in agriculture

Low energy consumption < 0.3 kWh/m³ of wastewater treated

Energy recovery from wastewater = 0.6 kW_e/ m³ of wastewater treated

Low O&M costs < 0.5 €/m³ of wastewater treated

Pay back period circa 9 years (depending on the characteristics of the system)