



**R**euse, **R**ecovery and **R**esource efficiency,  
Innovations in urban wastewater treatment

# Waste Water Treatment Plants (WWTP)

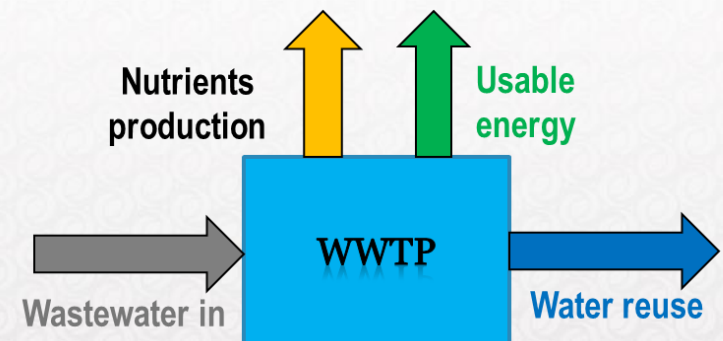
This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 619093.

## → WWTP today – meeting requirements

- A significant energy user
- Emissions of greenhouse gases
- Effluent might still contain viruses, pathogens and other unwanted contaminants
- Generated sludge is a problem

## → WWTP in the future – a production facility

- Net energy production
- Recovery of nutrients
- Resource efficient treatment
- Better treatment results
- Water reuse
- Generated sludge/waste is a resource

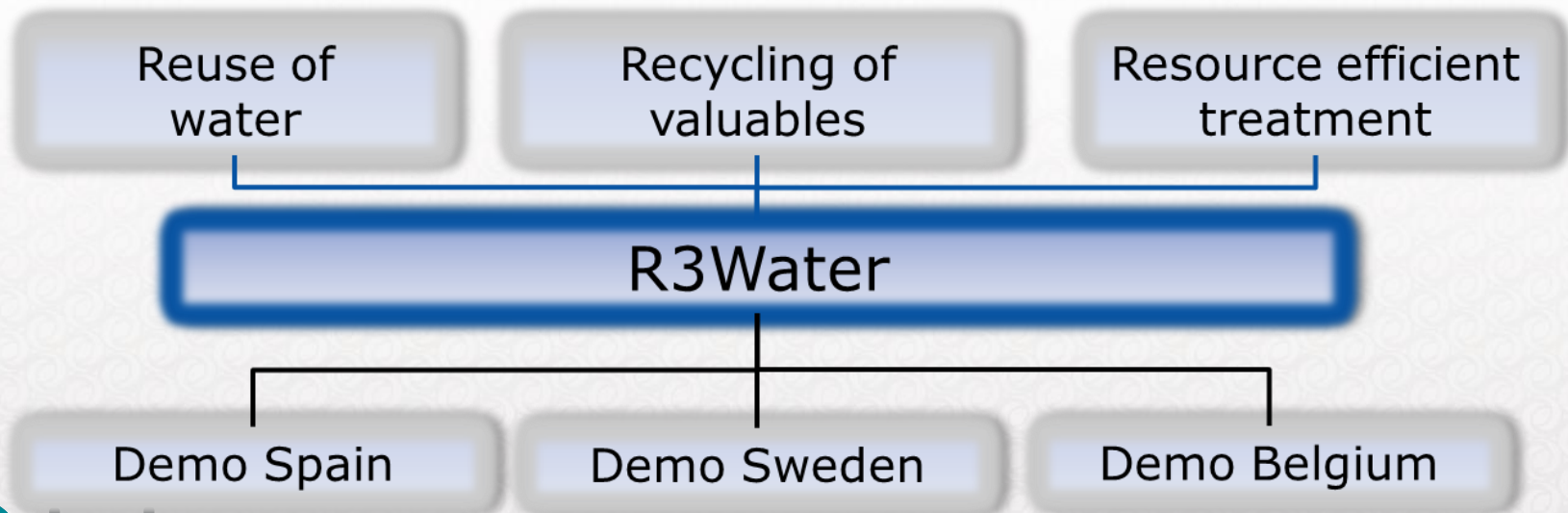




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## Project objectives

- ➔ To support the transition from an urban wastewater treatment plant to a production unit of different valuables by demonstrating new solutions to address main challenges
- ➔ To facilitate the market uptake of these innovative solutions





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## 12 partners (6 SMEs)

- Belgium: *Aquafin*
- Finland: *VTT, Ekolite*
- Germany: *DECHEMA, AVA-CO2*
- Great Britain: *Perlemax*
- Norway: *Prediktor*
- Spain: *Adasa, Icra, Teqma*
- Sweden: *Aqua-Q, IVL*



Map adapted from <http://ppt-toolkit.com>



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## Innovative areas covered

- ➔ Water reuse
  - Monitoring and control
  - Treatment of pharmaceuticals
  
- ➔ Recovery of valubles
  - Bio-char
  - Ash recovery
  - Phosphate Recovery
  
- ➔ Resource efficient treatment
  - Aeration
  - Process control
  - Anammox control



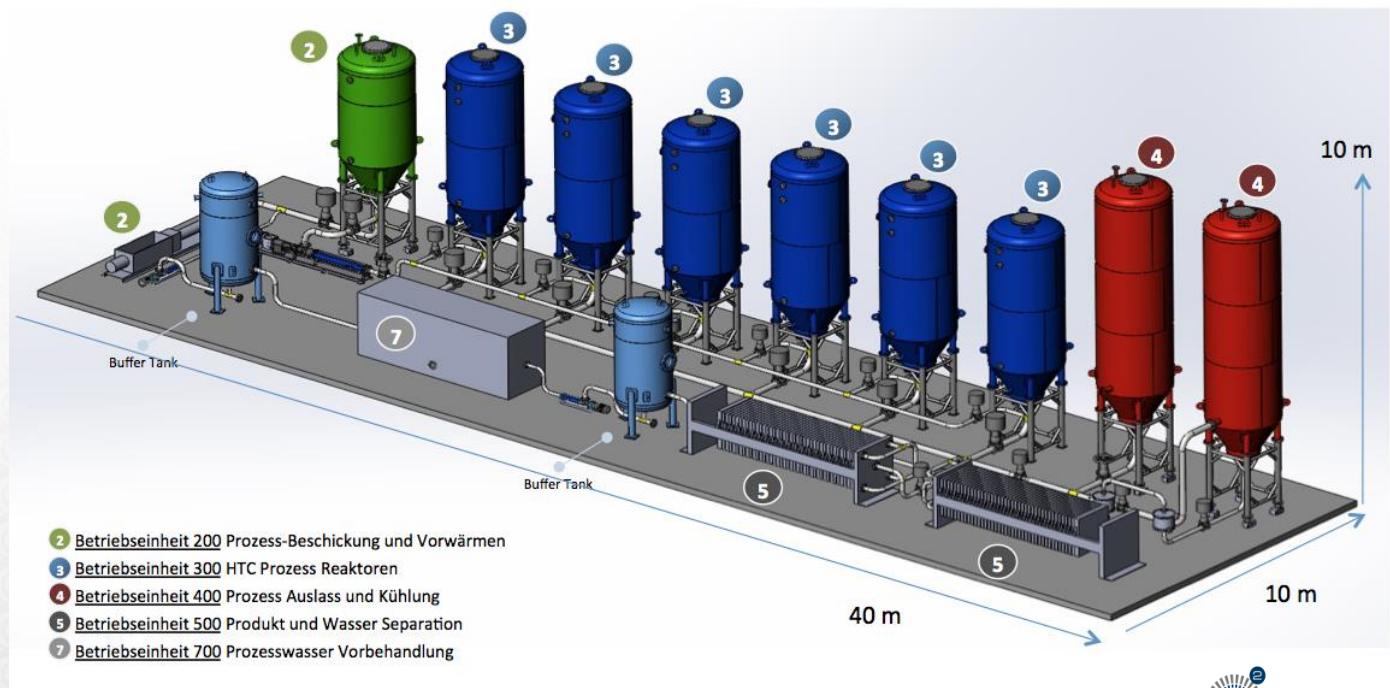
# HTC – hydrothermal carbonisation

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## Description

Hydrothermal carbonisation transforms biomass into CO<sub>2</sub>-neutral biocoal in an anaerobic thermochemical process forming a multitude of different carbon compounds

HTC is the most efficient process to treat and de-water wet biomass.



WATER REUSE



# HTC – hydrothermal carbonisation

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## Some Advantages

- CO<sub>2</sub>-neutral process
- Plug and play
- Wet process – Biomass can be used without expensive pre-drying
- Can process numerous biomass types e.g. sewage sludge that currently require expensive disposal
- Not in competition with foodstuff production, as biogenic waste can be used
- Simple, Proven and robust, multi-batch technology
- Low impact technology, very low odour or noise emissions
- Low maintenance costs
- proven, robust technical implementation
- Simple mechanical dewatering with filter presses to reach above 70% dry matter content
- Superior energy balance compared to thermal drying , Energy savings of up to 60%
- Organic micropollutant removal
- Allows for efficient phosphorous recovery.

## Demosite

- Different Sludges from Aquafin Wwtp processed in
  - Karlsruhe, Germany





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## HTC – Biochar a multifunctional product:

- ➔ Easily dried and pelletized
- ➔ Sterile and free from contaminants
- ➔ Low heavy metals content
- ➔ Valorisation e.g. as solid fuel with a high energy density, adsorbent for environmental remediation or water purification, or as soil amendment, enhancing soil fertility, water holding capacity and crop productivity.







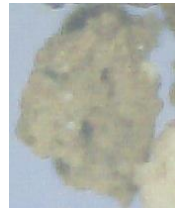
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## Ash recovery

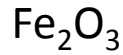
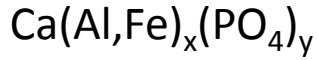
- ➔ Product processing concept for incinerated sludge ash valorization including its high value use as construction material and fertilisers
- ➔ Particle grinding and simultaneous mechanical activation by high speed impact milling.
- ➔ Technology to be tested in R3Water project with ash from Belgium
- ➔ Possible use for construction material



# Liberation



Grinding ->



Agglomerate

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Liberated particles  
Can be separated  
Easier to leach

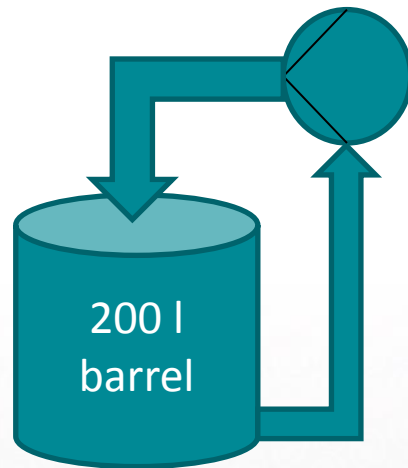
Magnetic separation

Flotation/reverse flotation



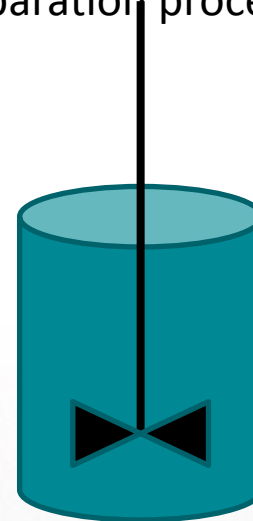
## Process

### Leaching



Heap leaching with 10% HCl  
6 hours

### Separation process



Liquid-liquid extraction  
or other process

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### Products for re-use:

- Metals for recycling in metal process
- Phosphorous for fertiliser
- Quartz particles as filler for concrete



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## Project managers and contact

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