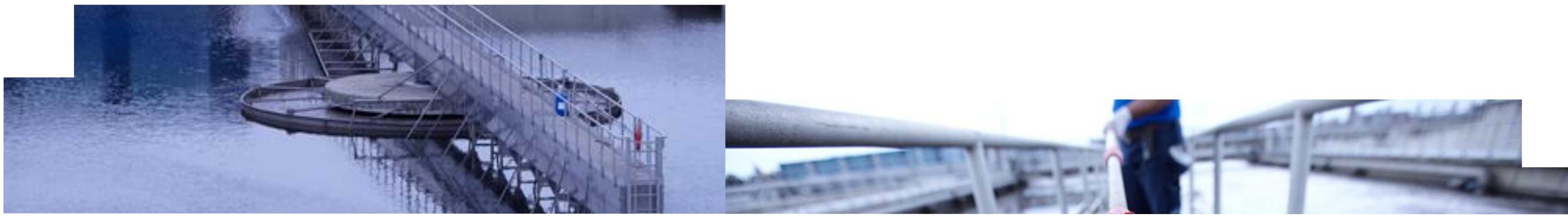


Wastewater treatment in Flanders: future challenges

Marjoleine Weemaes

Second European Symposium on Water Technology and Management
20-21 november 2013

Surface water quality in Flandres

1991

30% treatment

2012

80% treatment

Drivers for innovation

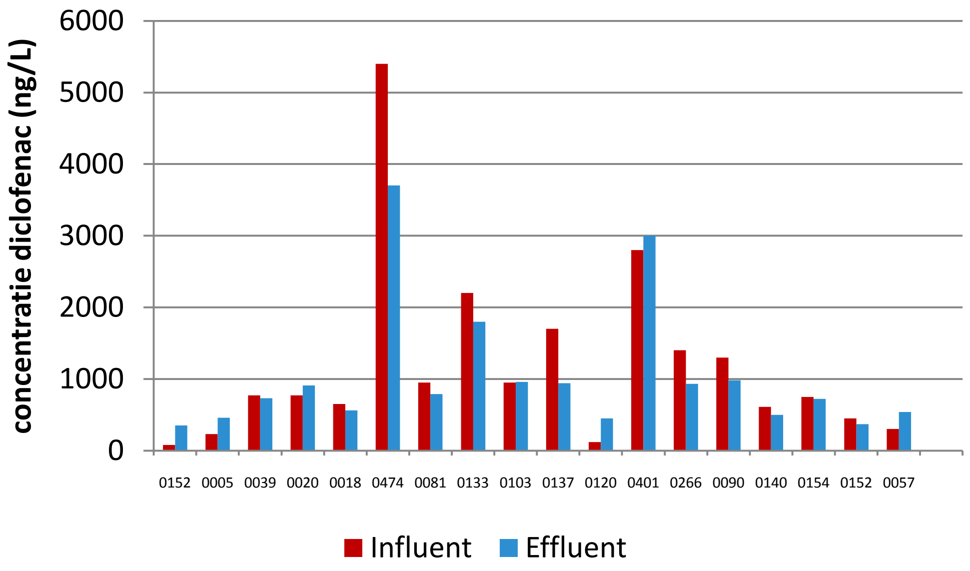
- Changing legislation
- Climate change
- Population growth

➔ Focus shift

Pharmaceuticals in wastewater

- Daughter directive on priority pollutants
  - Watch list of emerging pollutants
    - Ethenylestradiol
    - Estradiol
    - Diclofenac

Analytical techniques



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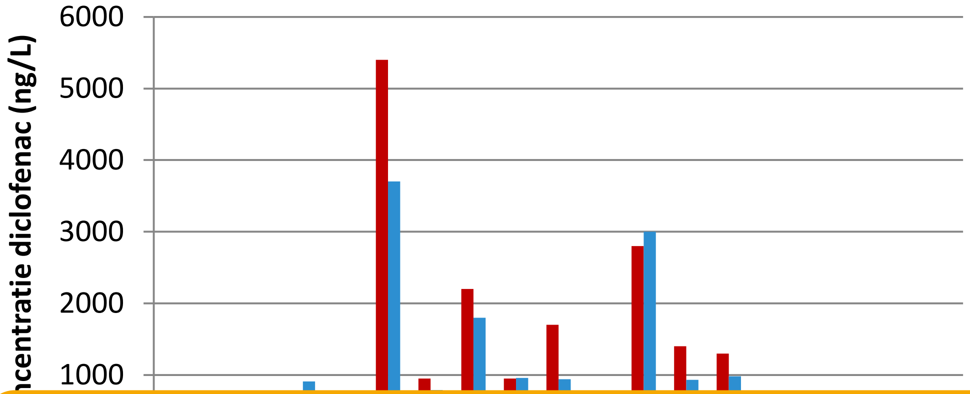

Develop strategic approach to the risks posed by pharmaceuticals in the aquatic environment

Pharmaceuticals in wastewater

- Source control
- End of pipe treatment

Post treatment	Dose mg/L	Electricity consumption kWh/m^3	Primary energy kWh/m^3	Costs 30.000 PE €/m^3	Costs 500.000 PE €/m^3
Ozone + sandfilter	3-10	0,1-0,2	0,3-0,6	0,15-0,2	0,05-0,07
Powder AC + filter	10-20	0,05	0,5-0,8	0,25-0,3	0,09-0,11

Source: EU FP 7 project Neptune, project (Contract No 036845, SUSTDEV-2005-3.II.3.2),

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Conventional wastewater treatment : 0,7 €/m^3

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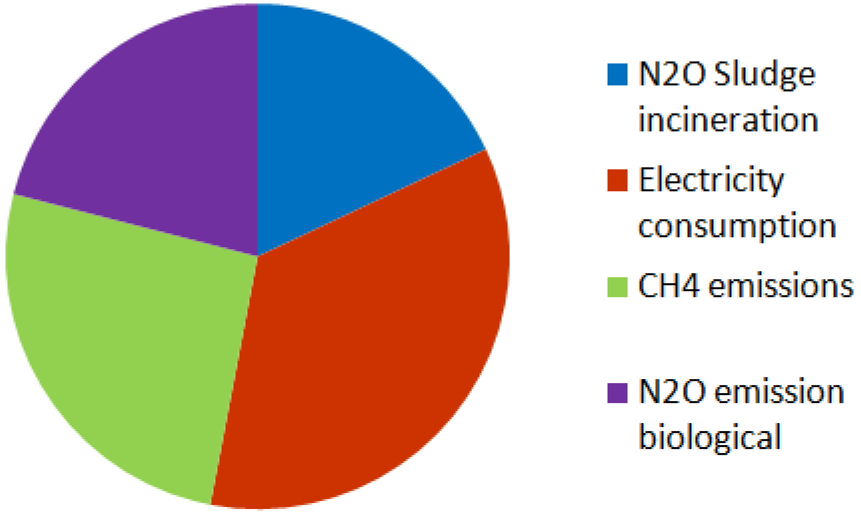
Cheap and reliable removal technologies

Greenhouse gas emissions

- Electricity consumption wastewater treatment
  - 0,09 kWh/pp.d
  - Energy reduction measures
- Greenhouse gas emissions
  - Sludge incineration
  - Direct emissions CH_4 and N_2O



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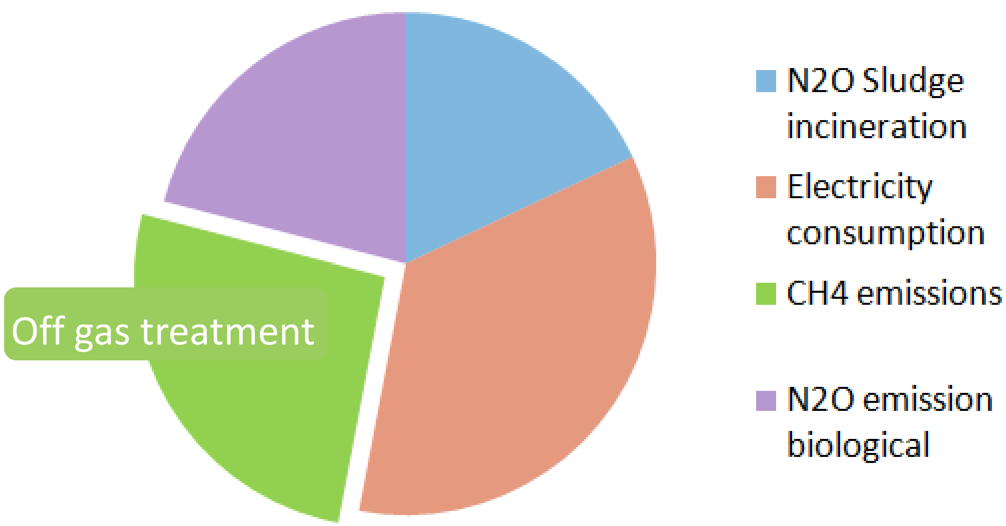

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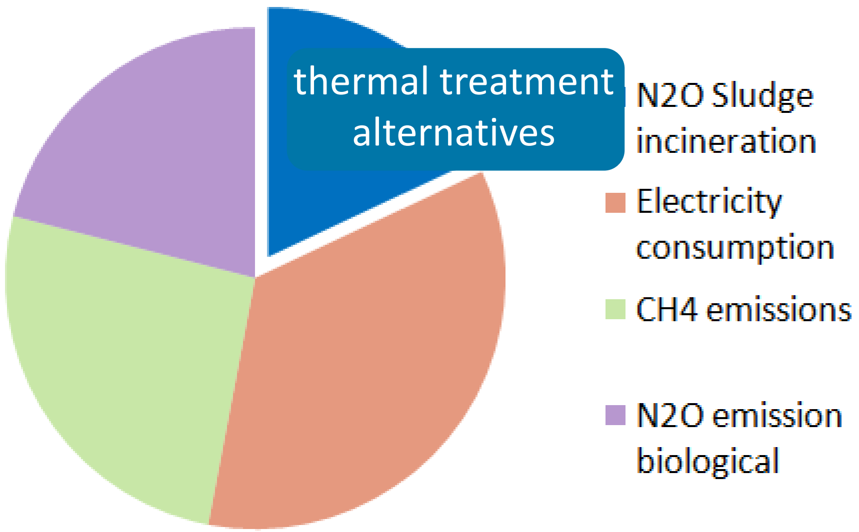

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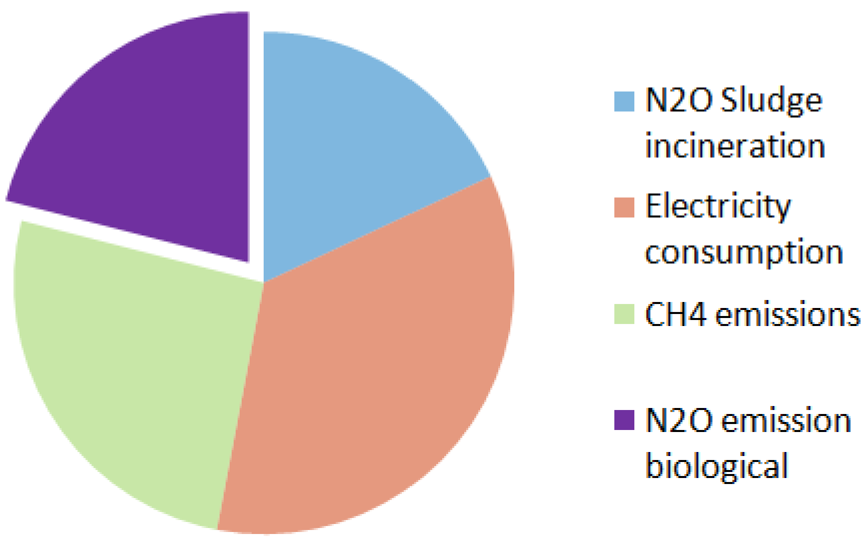

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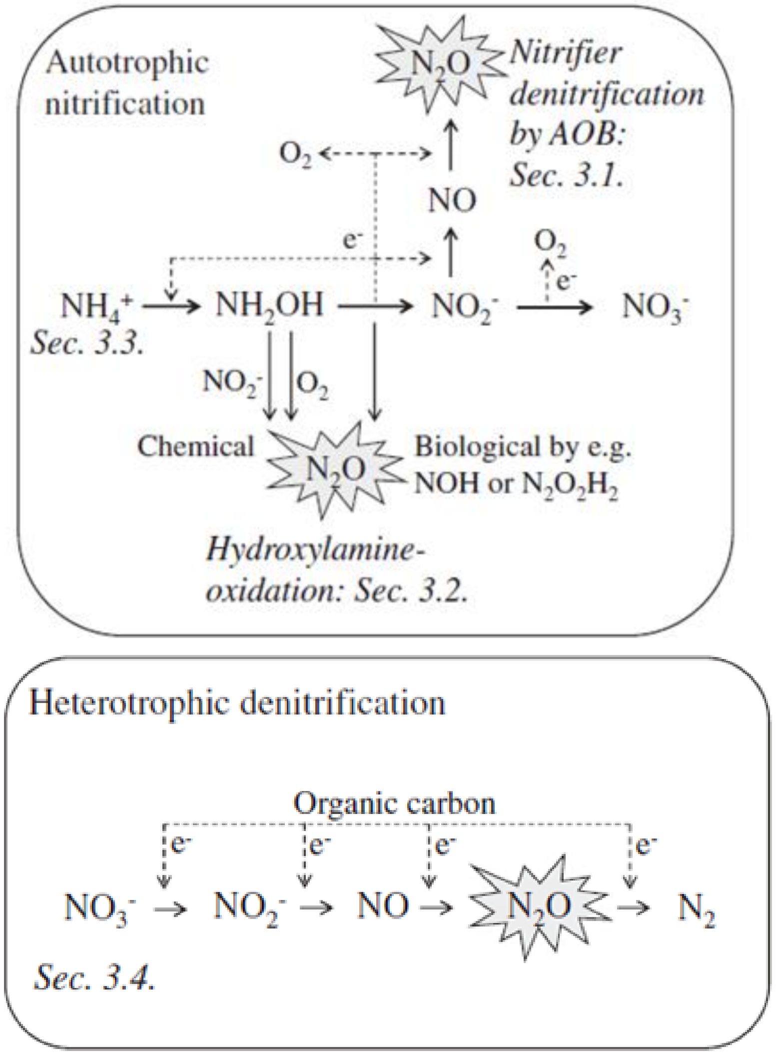

Wunderlin et al., 2012, Water Wesearch 4 6 (2012) 1027-1037

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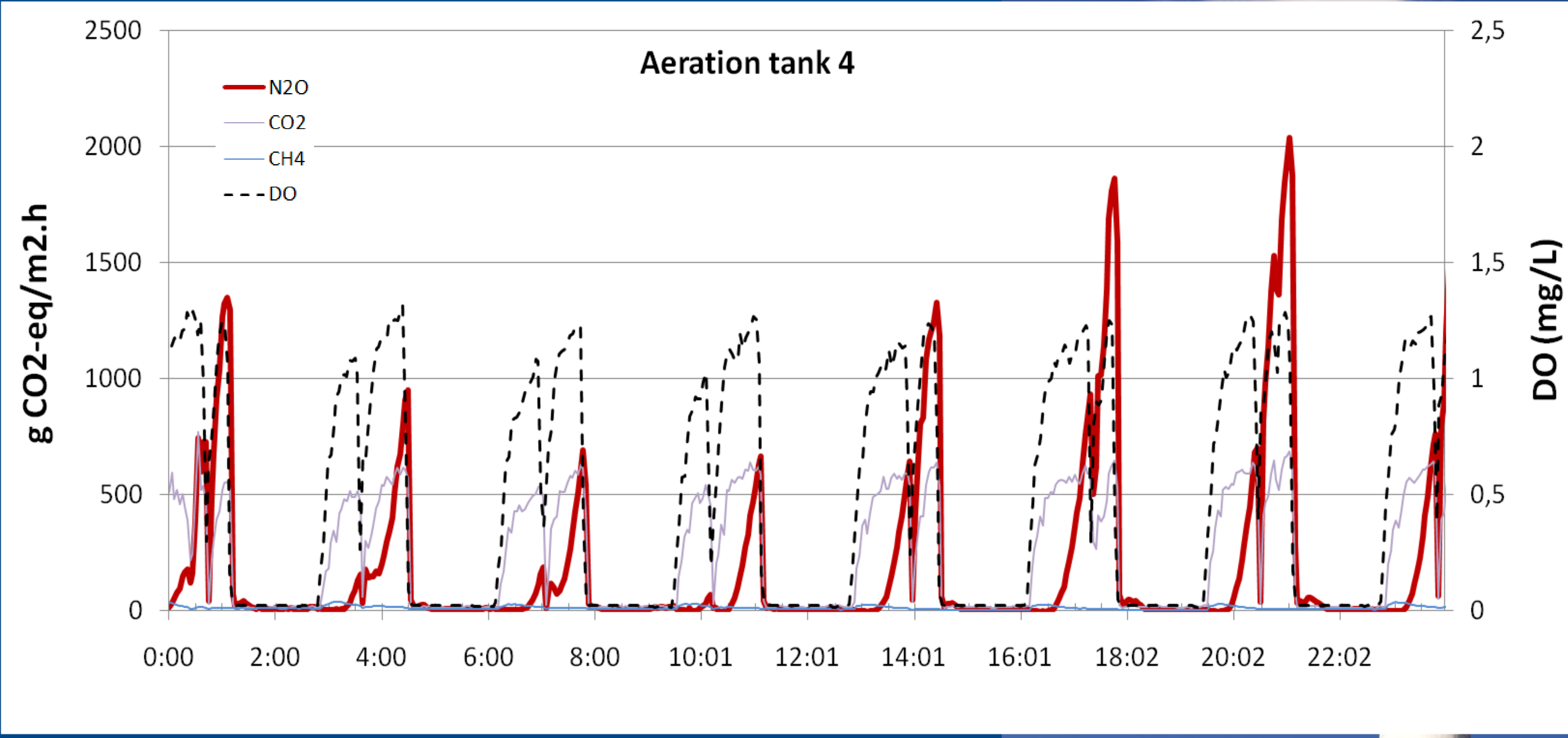

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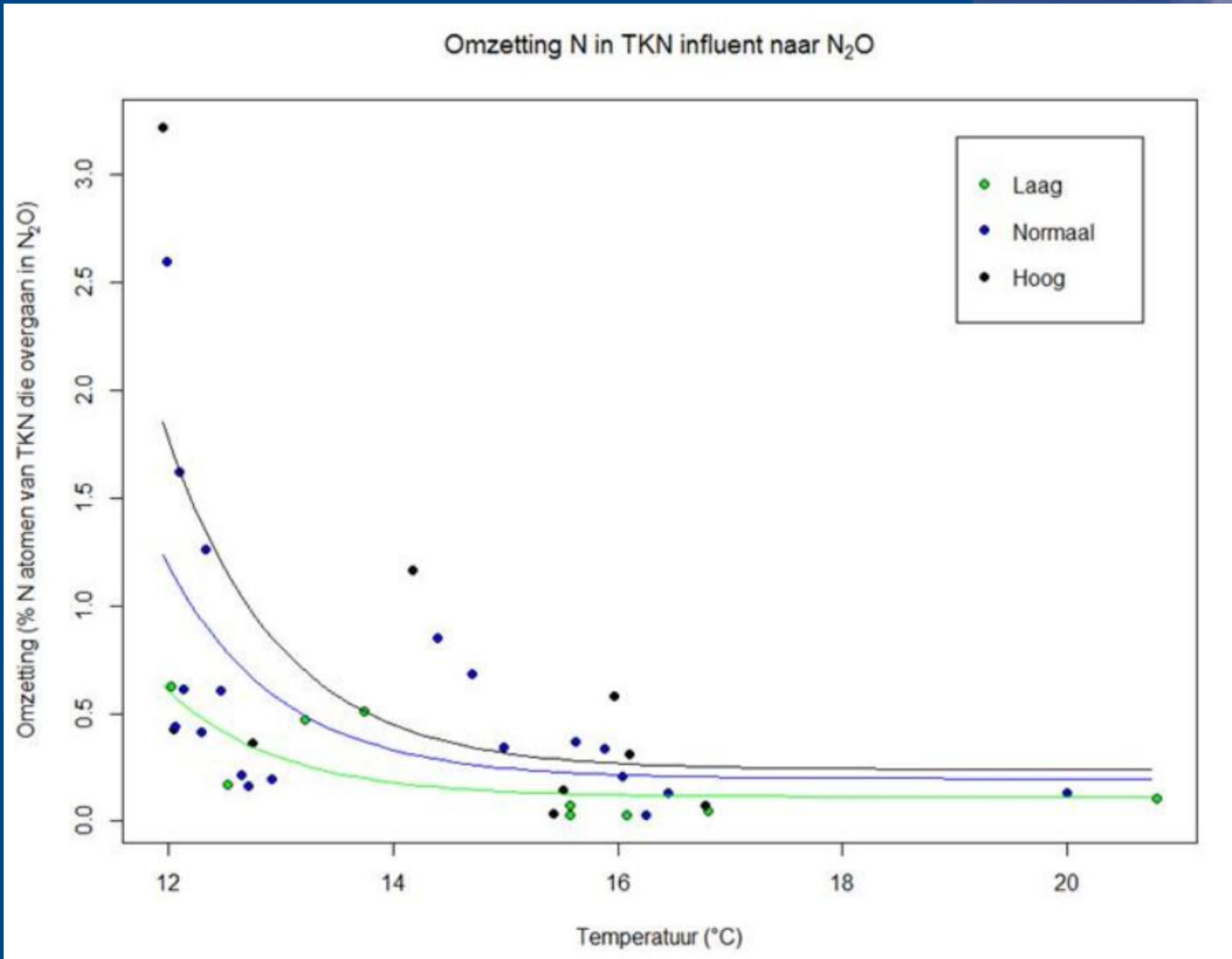

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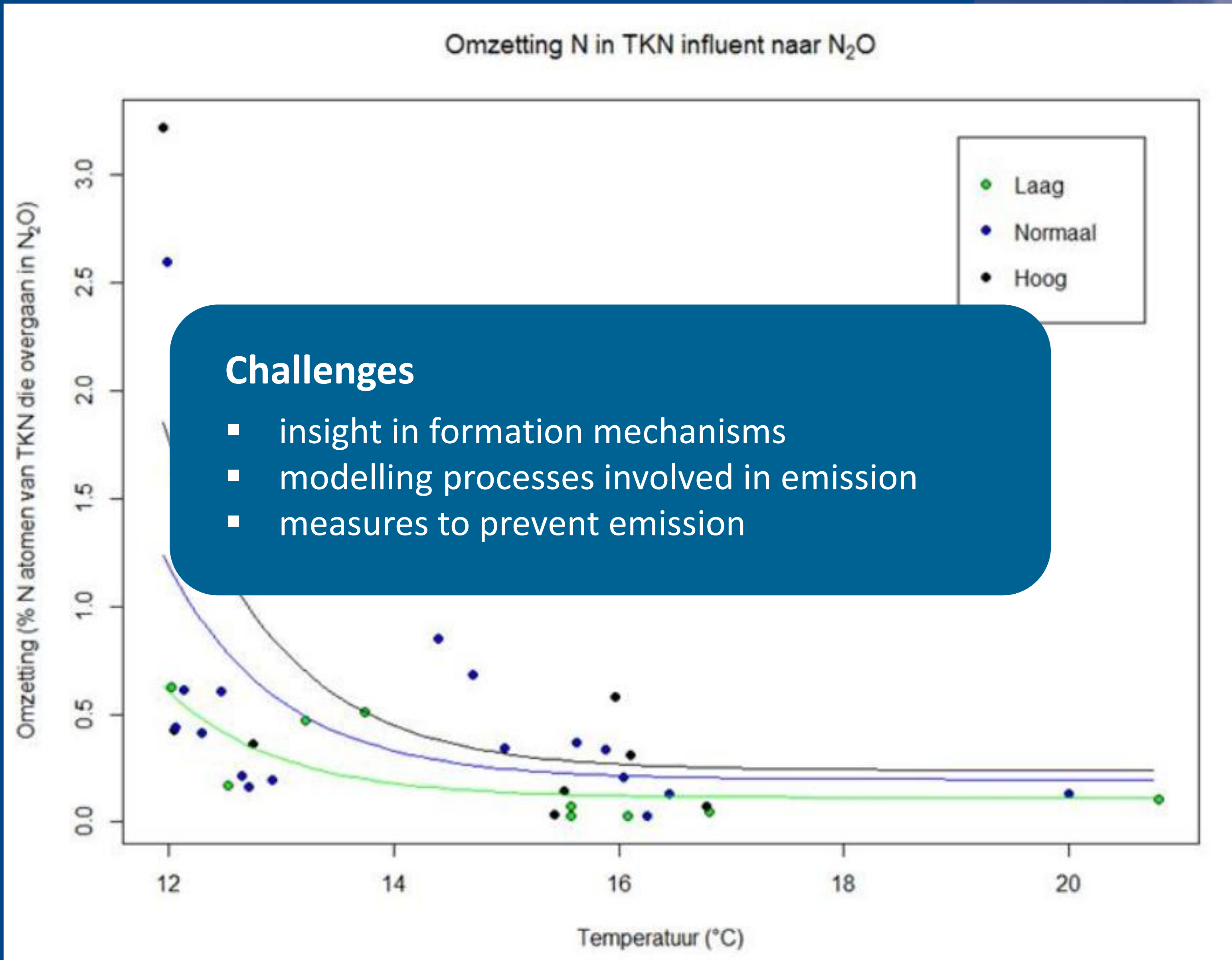
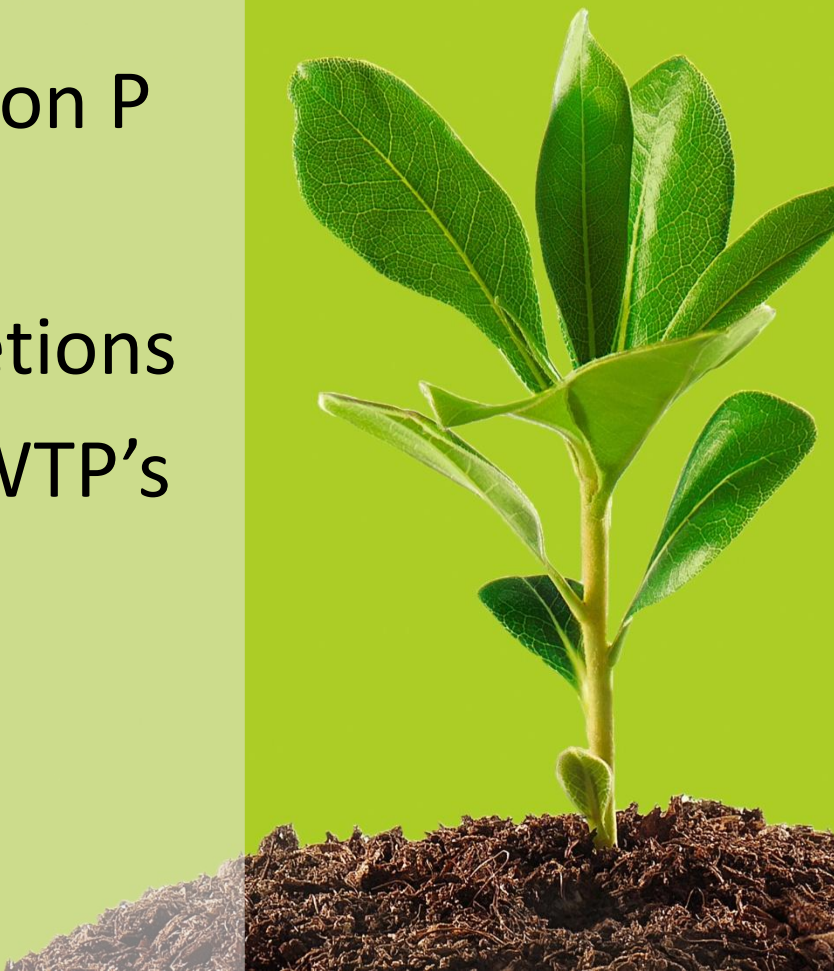


Challenges

- insight in formation mechanisms
- modelling processes involved in emission
- measures to prevent emission

Nutrient recovery

- Phosphorus recovery
- Yearly mining: 14,9 mio ton P
- 90% for feed
- 3 mio ton in human excretions
- +/- 9 ton P/day in Aqf WWTP's
- Recovery potential?
  - Liquid phase: struvite
  - Ashes



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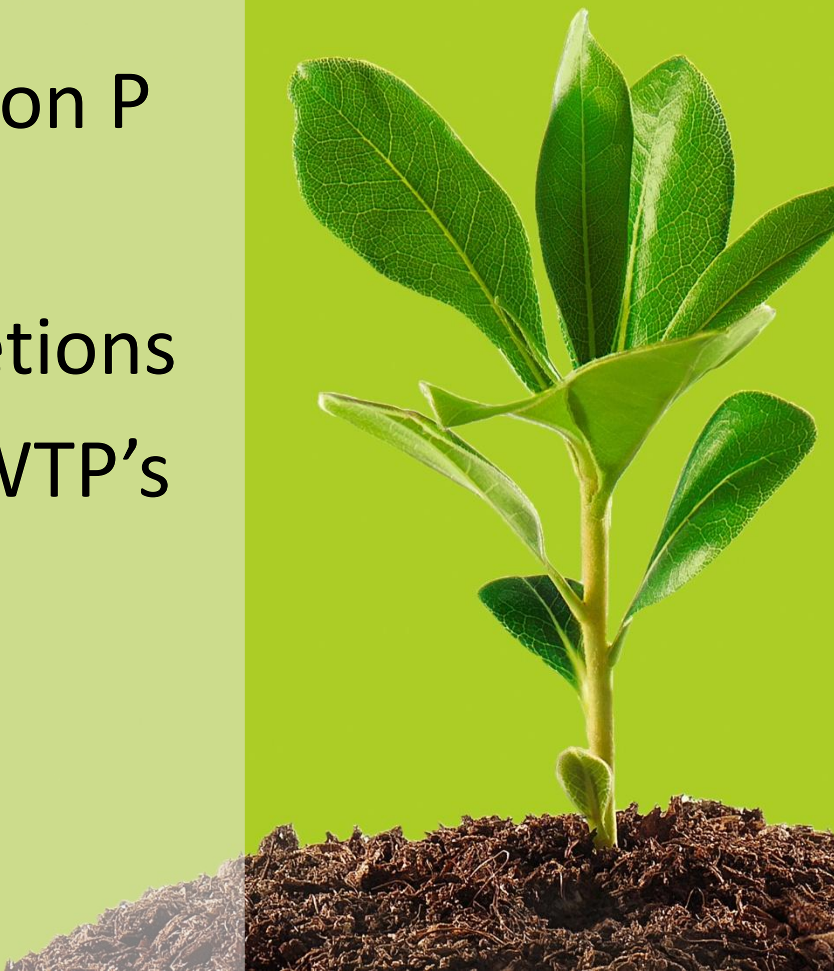
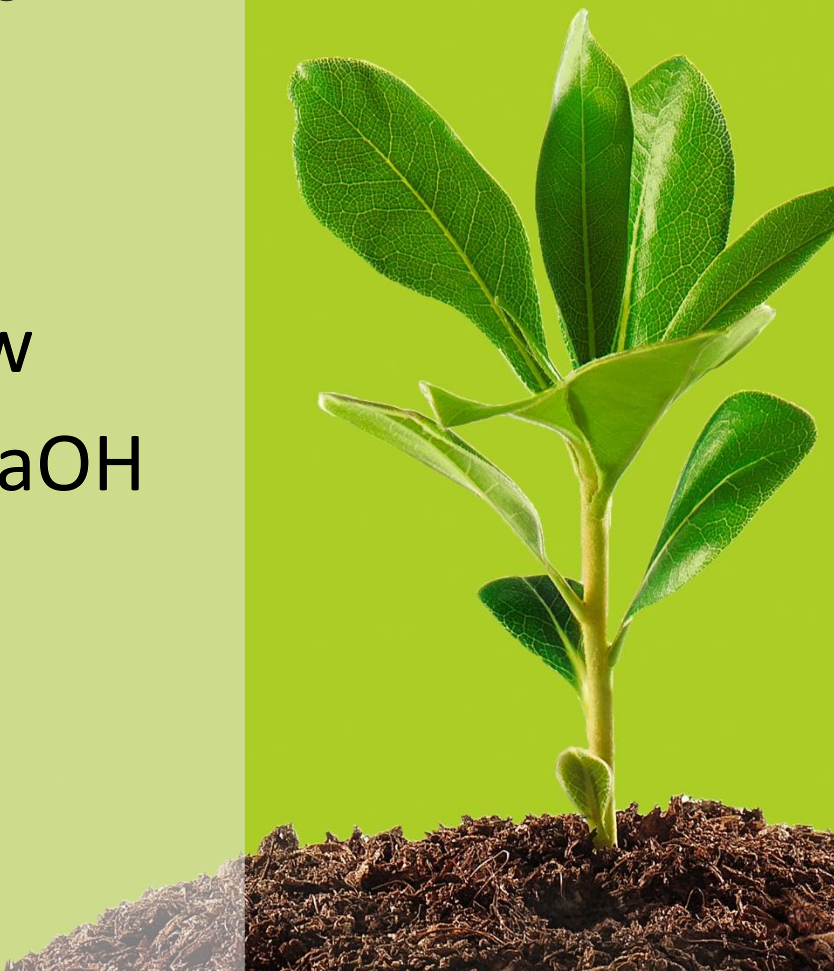


Nutrient recovery

Struvite recovery pilot plant

- NuReSys technology
- 8 m^3/h inflow (digestate)
- 220 mg P/l as PO_4^{3-} inflow
- pH reactor 7.5 ~ kWh + NaOH
- 1.2 Mg/P setpoint




VERSCHOORE
CONSTRUCTIE
VERSCHOORE
VRANCKX
UITZONDERLIJK
VERVOER
VRANCKX
VRANCKX
LIEBHERR

Nutrient recovery

Costs

- Investment
- Man hours: 1.5…5 h/week
- Chemicals: MgCl & NaOH
- kW : 7 (blower + circulation pump + dosing pumps)
- Maintenance

Benefits

- Struvite price ~ € 50-75/ton?
- ± 1% DS ~ €!!
- Lower PE use
- N and P load in rejection waters …10-15%↓
- Natural scaling ↓

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Nutrient recovery

Nitrogen removal

- Conventional air stripping : 100-150 MJ/kg/N
- Air striping 1.9-3.2 €/kg N
- Anammox: 0.8 €/kg N
- Haber Bosch + anammox: 60 MJ/kg N

(source: Stowa)

➔ Reduction or use of waste chemicals/heat

Other recovery potentials

Wastewater as a carbon source

- Bioplastics
- Cellullose
- Energy nexus

Research

Water reuse

- Water
- Landscape revaluation
- Irrigation
- Drinking water

➔ **safety monitoring**

Known technology

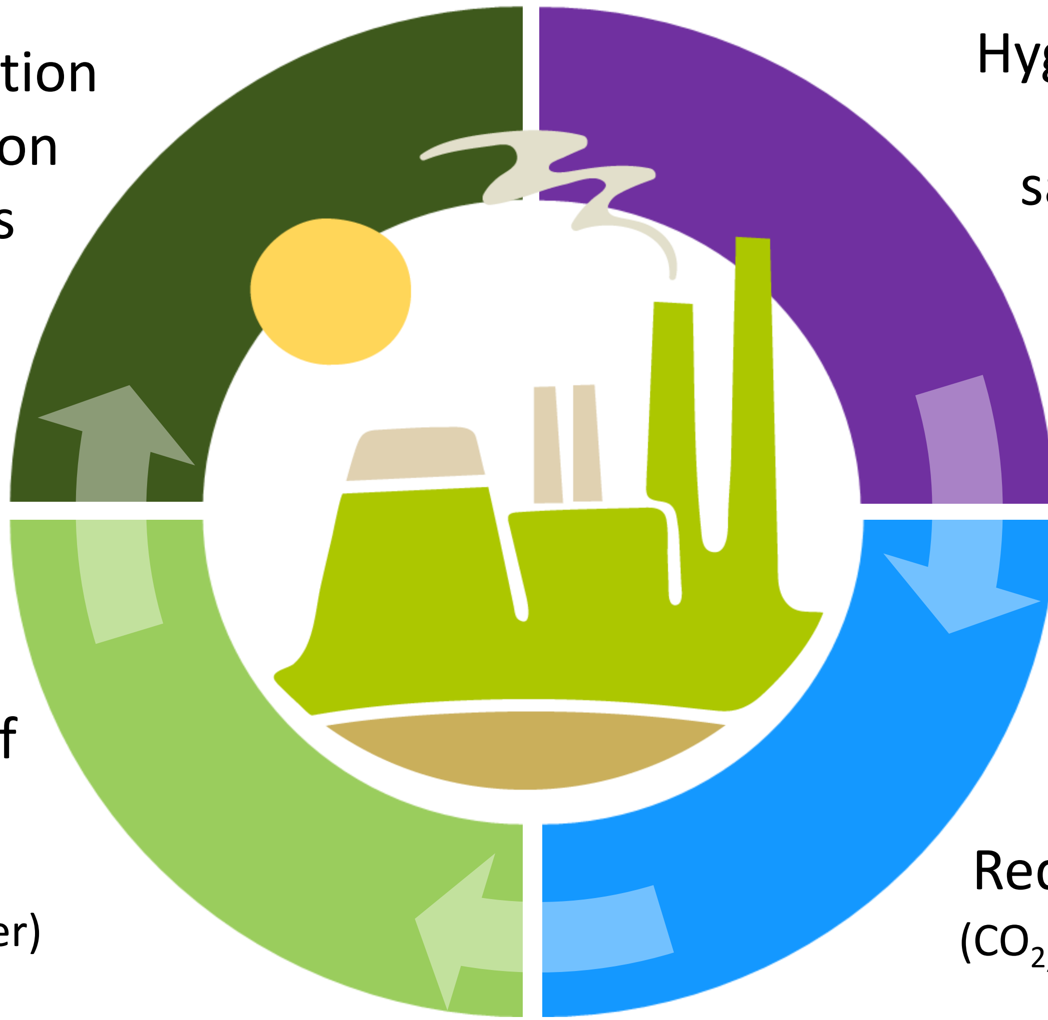
WWTP's: from waste to source

Transformation to production facilities

Future

Hygienization and sanitation

Current practice



Recovery of valuable resources
(nutrients, water)

Research

Reduced impact
(CO_2, micropollutants)

Under implementation