

# BSR WATER

Solutions to enhance recycling of  
nutrients in waste water sector

TAAVO TENNO

University of Tartu

PLATFORM  
BSR WATER

 **Interreg**  
Baltic Sea Region

 EUROPEAN UNION  
EUROPEAN  
REGIONAL  
DEVELOPMENT  
FUND

 UNIVERSITY OF TARTU

# BSR WATER project

enhance cross-sectoral cooperation in smart water management by transnational experience exchange, sharing good practices and delivering a comprehensive overview of the current and future BSR policy contexts.

# BSR WATER

Platform on  
Integrated Water  
Cooperation



**Duration:**  
1 October 2018 to  
31 March 2021

10



Partners

19



Associated partners

**Funding:**  
Interreg BSR  
Programme  
2014–2020



**Budget:**  
EUR 1,133,440.40  
million

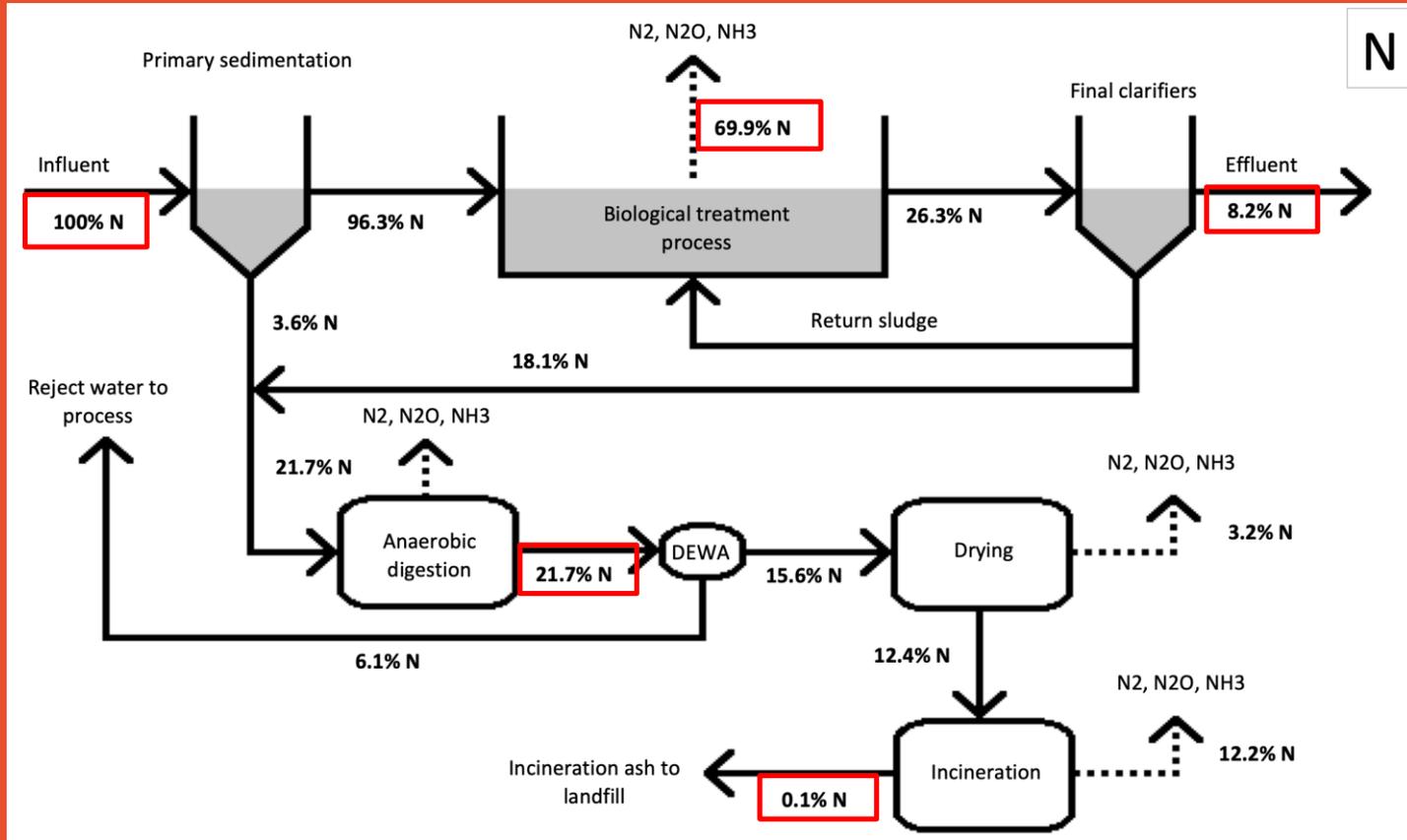
9

Countries  
from Baltic  
Sea Region



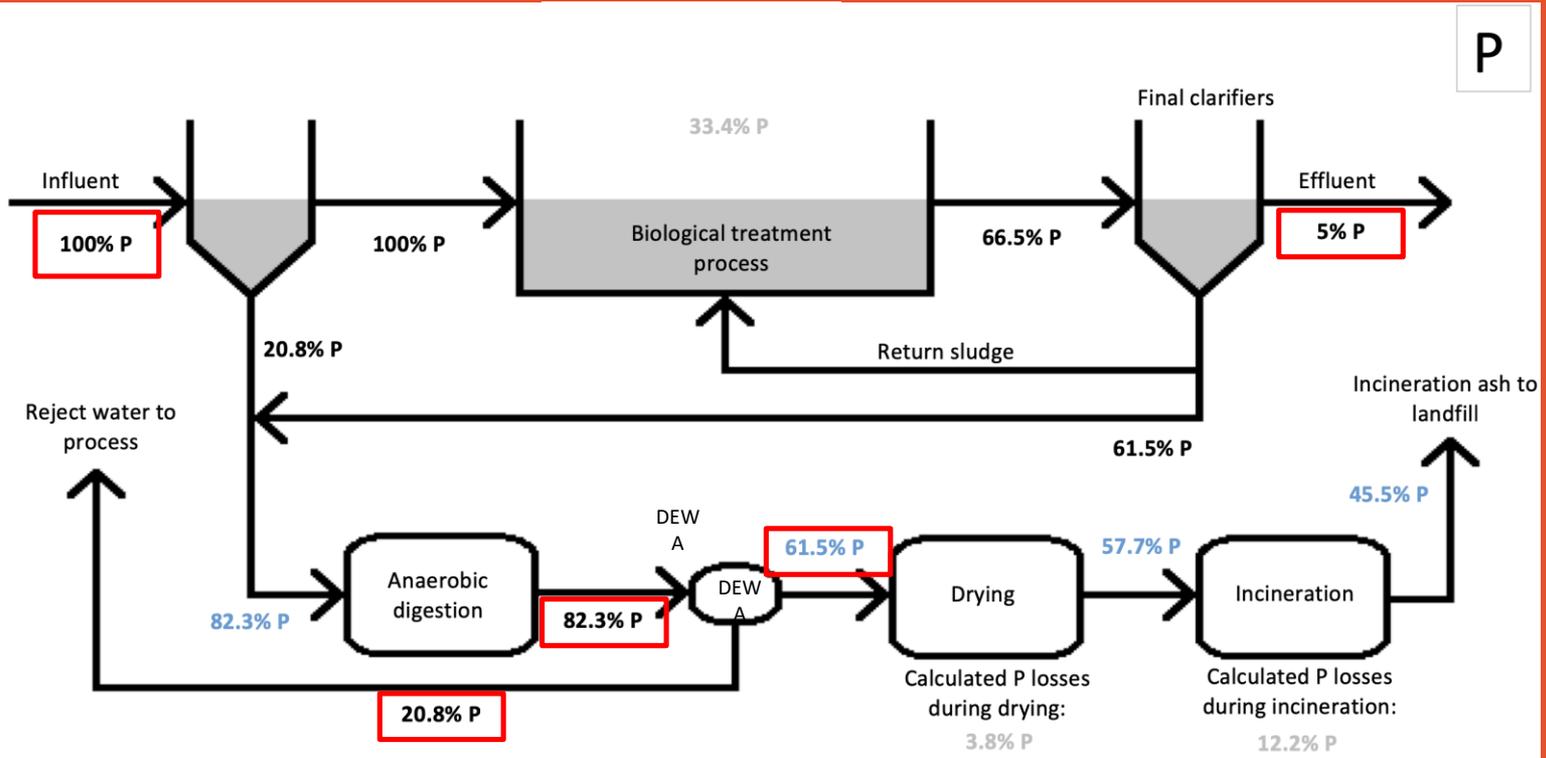
[www.bsrwater.eu](http://www.bsrwater.eu)

# IWAMA - Sludge audit – nitrogen reuse potential



# Sludge audit - phosphorous reuse potential

P



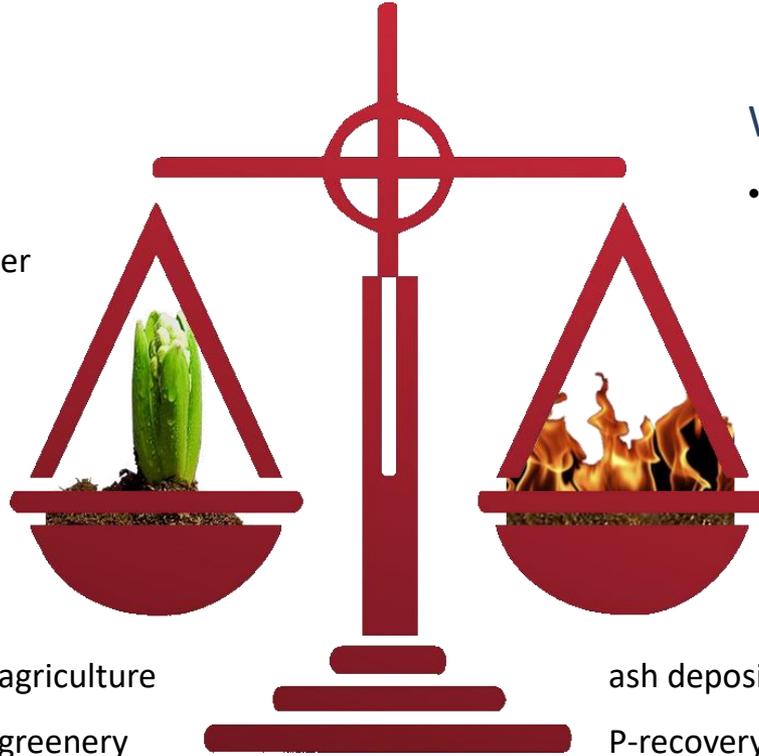
# Should the sewage sludge be reused?

## FERTILIZER

- N, P, K, Mg, ..
- Organic fertilizer
- Cheap

## SLUDGE REUSE

agriculture  
greenery  
recultivation



## WASTE

- Anthropogenic contamination
  - Heavy metals,
  - Pharmaceuticals
  - Microplastics

## NUTRIENT RECYCLE & RECOVERY

ash deposit  
P-recovery

# How is sludge managed in the Baltic Sea area?

Biogas

Agriculture  
Greenery

Biogas

Incineration

Biogas

Agriculture  
Greenery

Biogas  
Composting

Biogas  
Drying

Agri  
Accumul

Landfill  
Agri

Biogas  
Composting

Agriculture  
Greenery

Biogas  
Composting

Agriculture  
Greenery

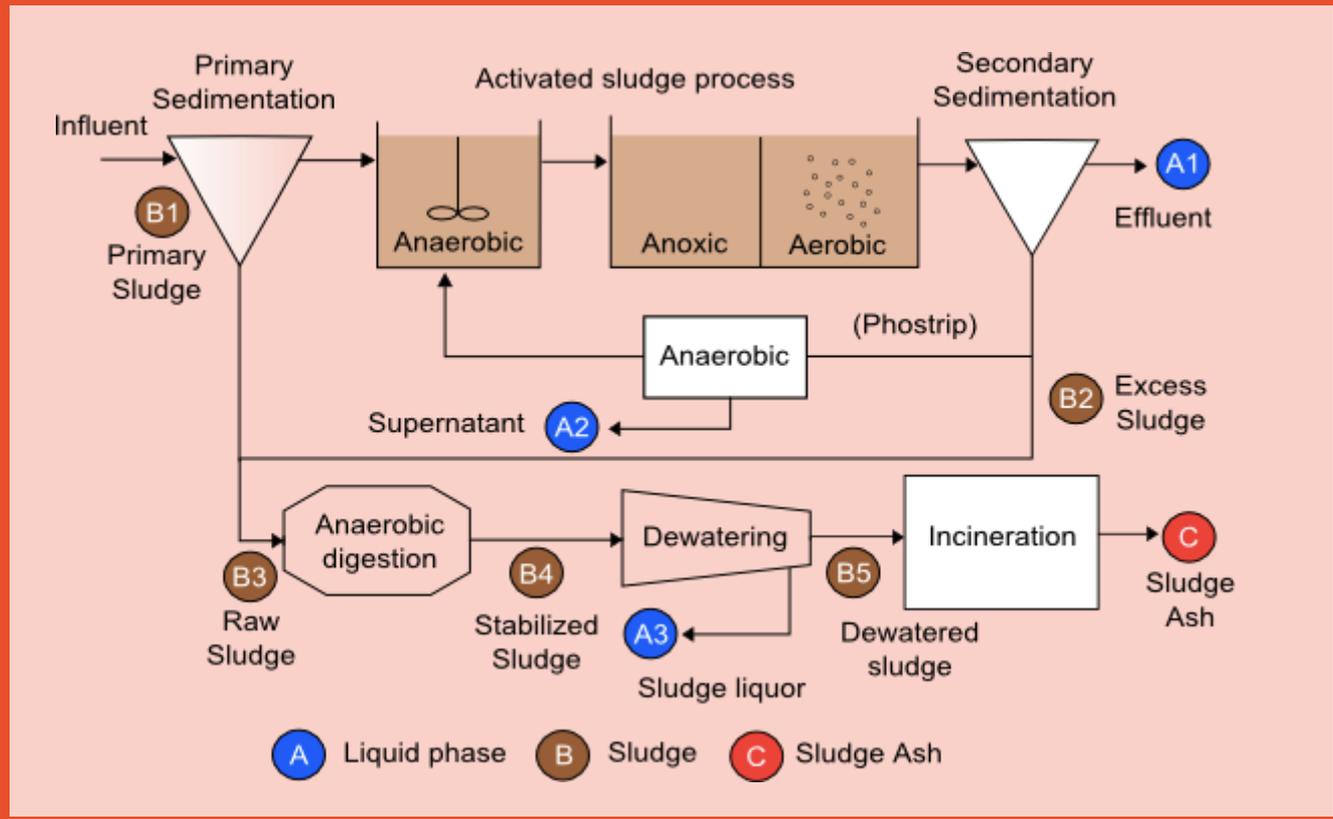
Biogas  
Composting

Biogas  
others

Incineration  
Landfill  
Accumul

Incineration  
Agriculture

# Phosphorous recovery from sewage sludge



# Technologies for P-recovery

	Crystallization	Wet Chemical	Thermochemical
Liquid phase	X		
Sewage sludge	X	X	
Sewage sludge ash		X	X

# Which products are recovered?

- Struvite – Magnesium Ammonium Phosphate (MAP)



- Low water solubility ((0.18 g/l at 25°C)
- Slow fertilizer



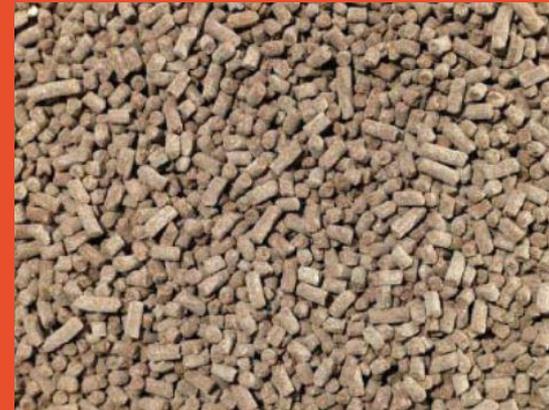
- Hydroxyapatite (Calcium phosphate)



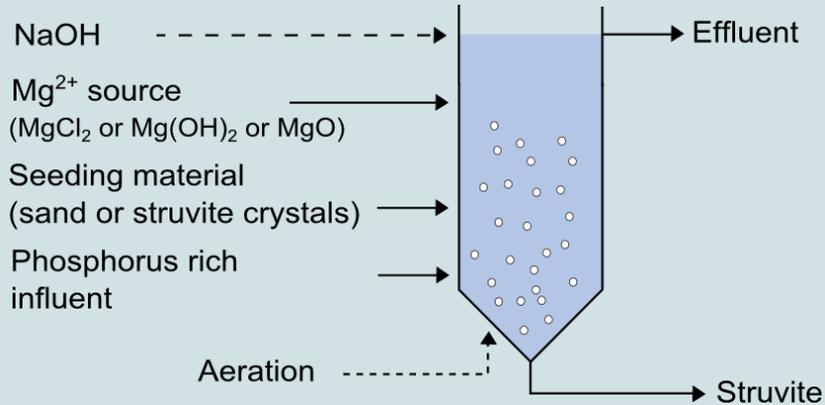
- Similar to the mined mineral rock

- Sewage Sludge Ash

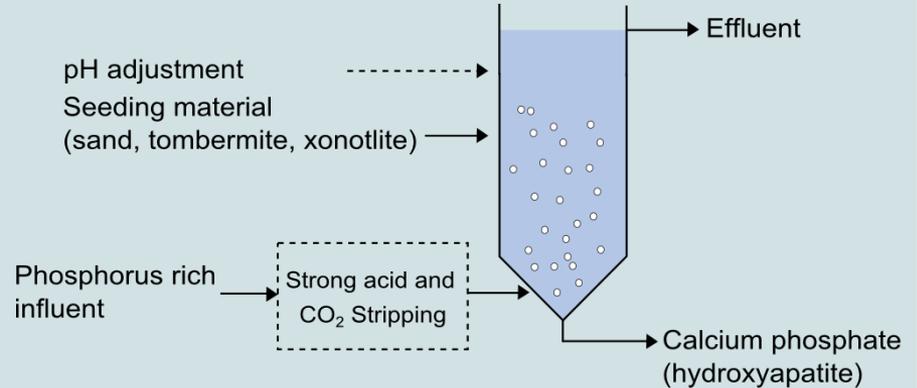
- Reduction of heavy metal content
- Bioavailability of phosphorous enhanced



# Crystallization from liquid phase



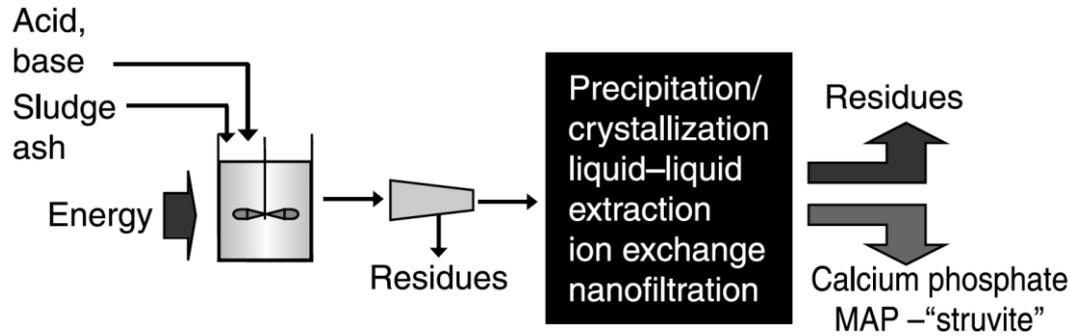
Crystallization of struvite



Crystallization of calcium phosphate

# P-Recovery from sewage sludge and ash

Wet chemical technologies

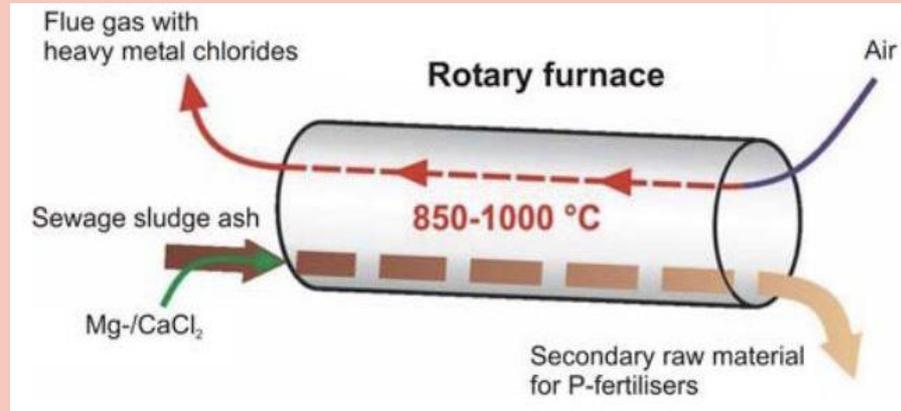
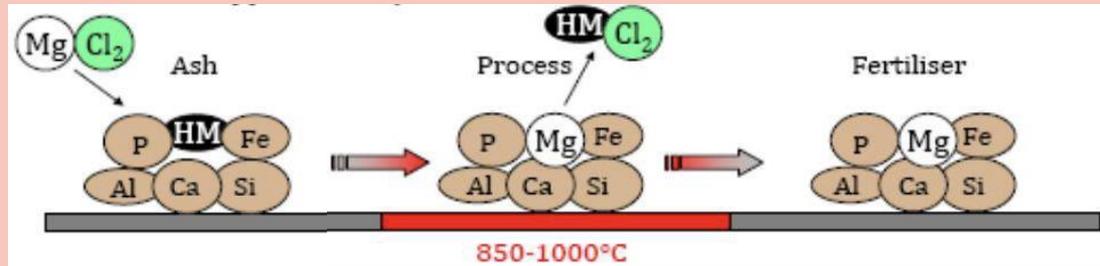


Release of phosphorus/metals

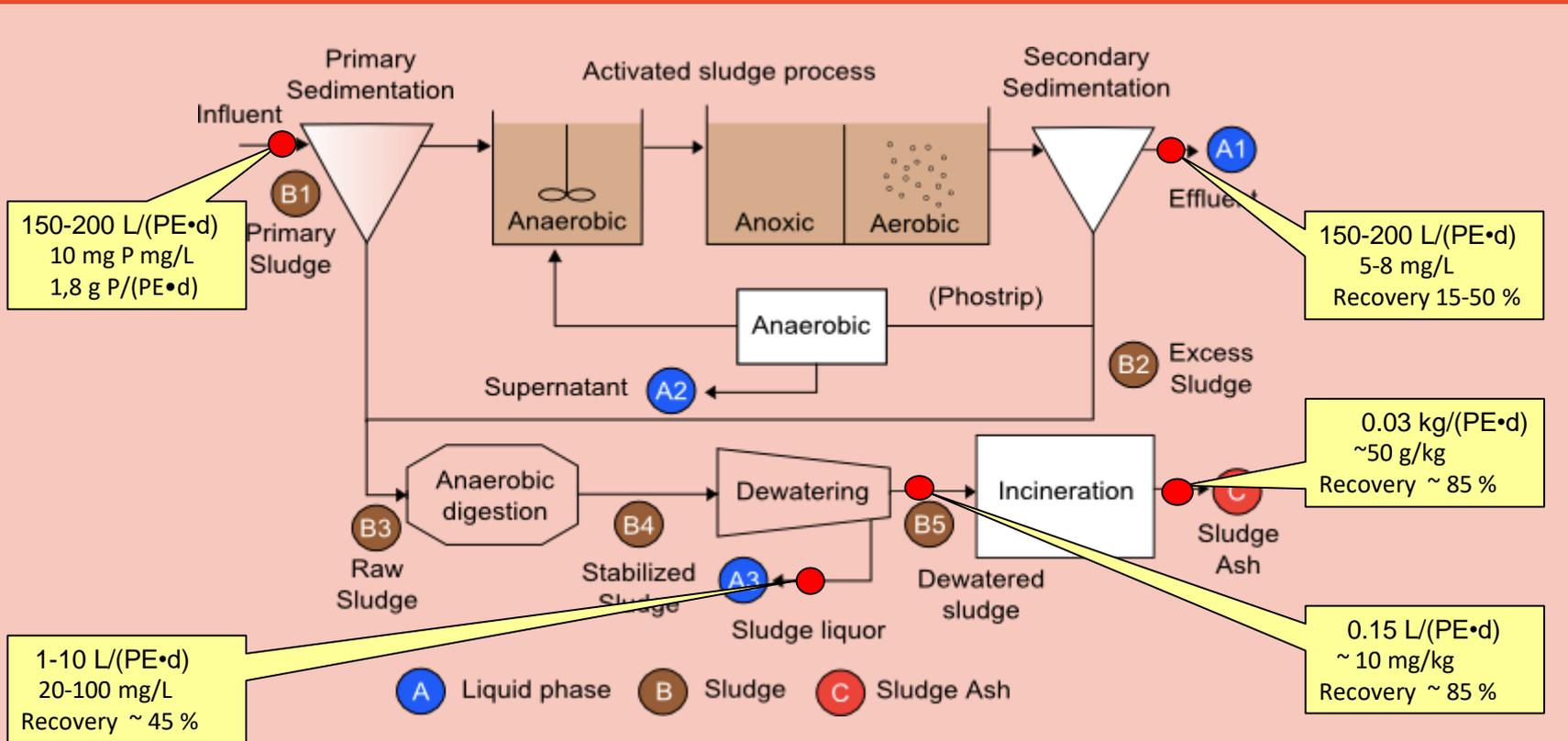
Separation of phosphorus

# Thermochemical technologies

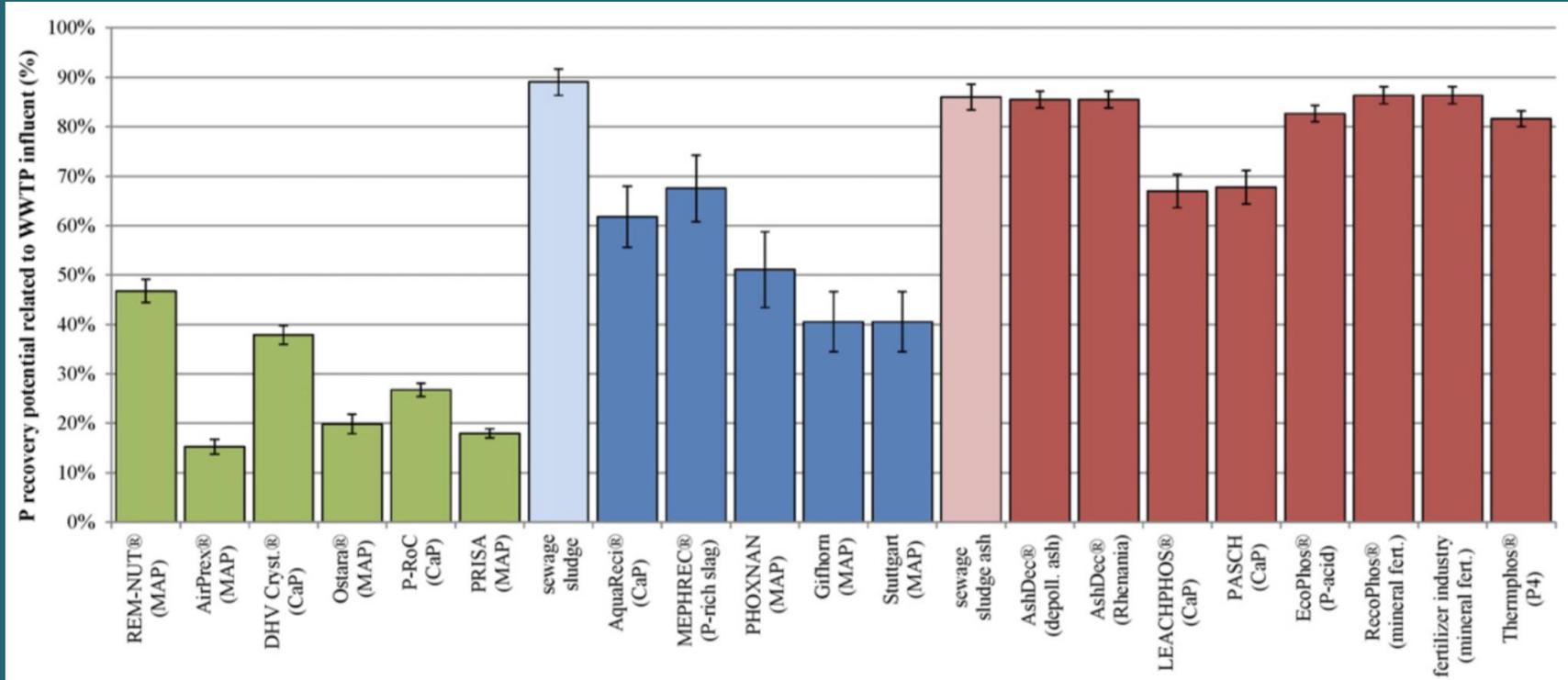
Recovery from sewage sludge ash



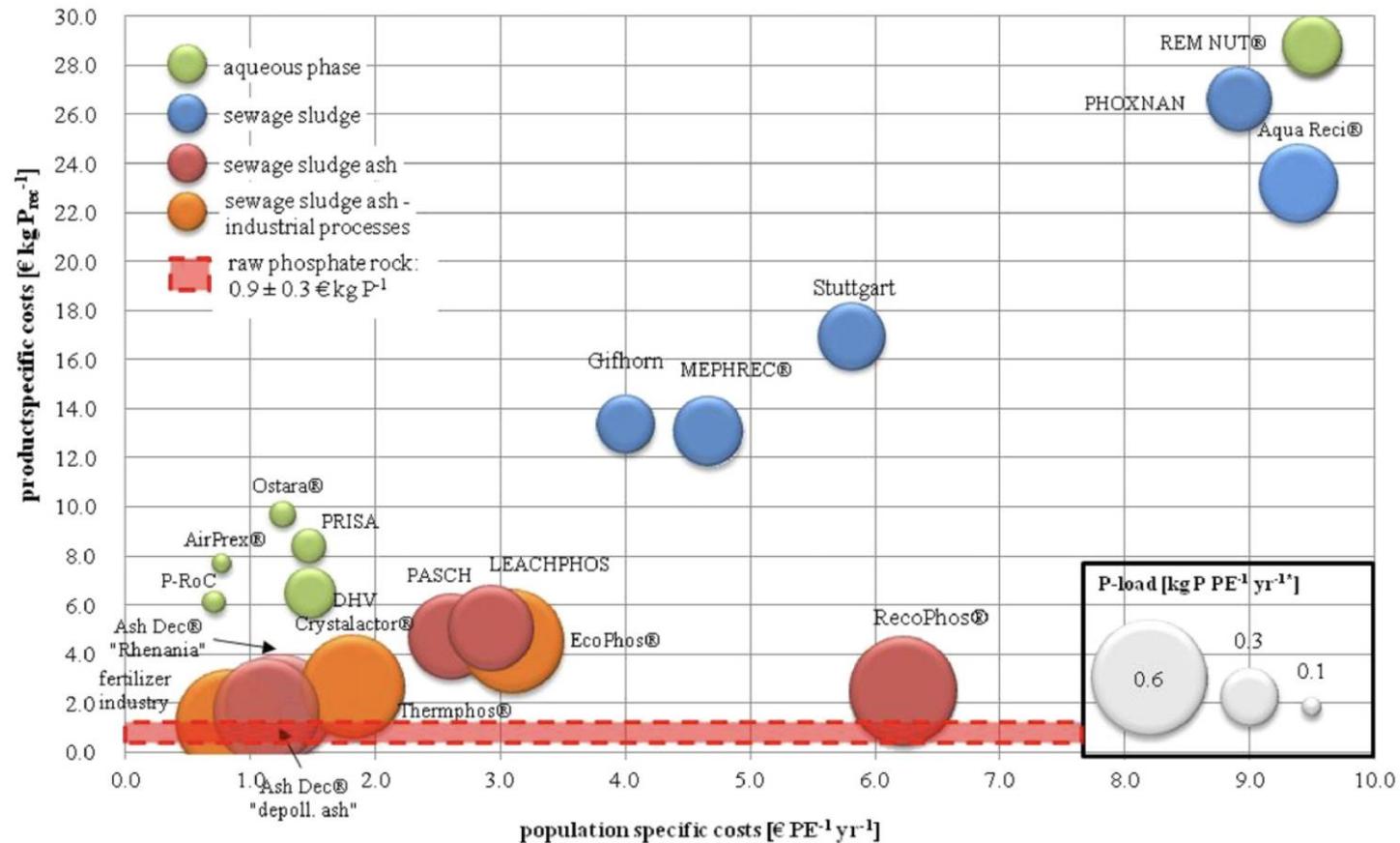
# Phosphorous recovery from sewage sludge



# P recovery potential (%) of recovery technologies relative to the WWTP influent.



# Economy of P recovery



# Thank you!

## CONTACT

Taavo Tenno

Taavo.Tenno@ut.ee

[www.bsrwater.eu](http://www.bsrwater.eu)

PLATFORM  
**BSR** WATER

 **Interreg**  
Baltic Sea Region

  
EUROPEAN UNION  
EUROPEAN  
REGIONAL  
DEVELOPMENT  
FUND

 **UNIVERSITY OF TARTU**