

Use of iron and aluminium coagulants in wastewater treatment

Phosphorus removal and challenges of phosphorus recovery

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INCOPA - the European Inorganic Coagulants Producers Association

Aluminium and iron salts are essential elements for water treatment, paper manufacturing, fertiliser production and other industries.



29
PRODUCERS



80
PRODUCTION
SITES



85% of the European
PRODUCTION
CAPACITY

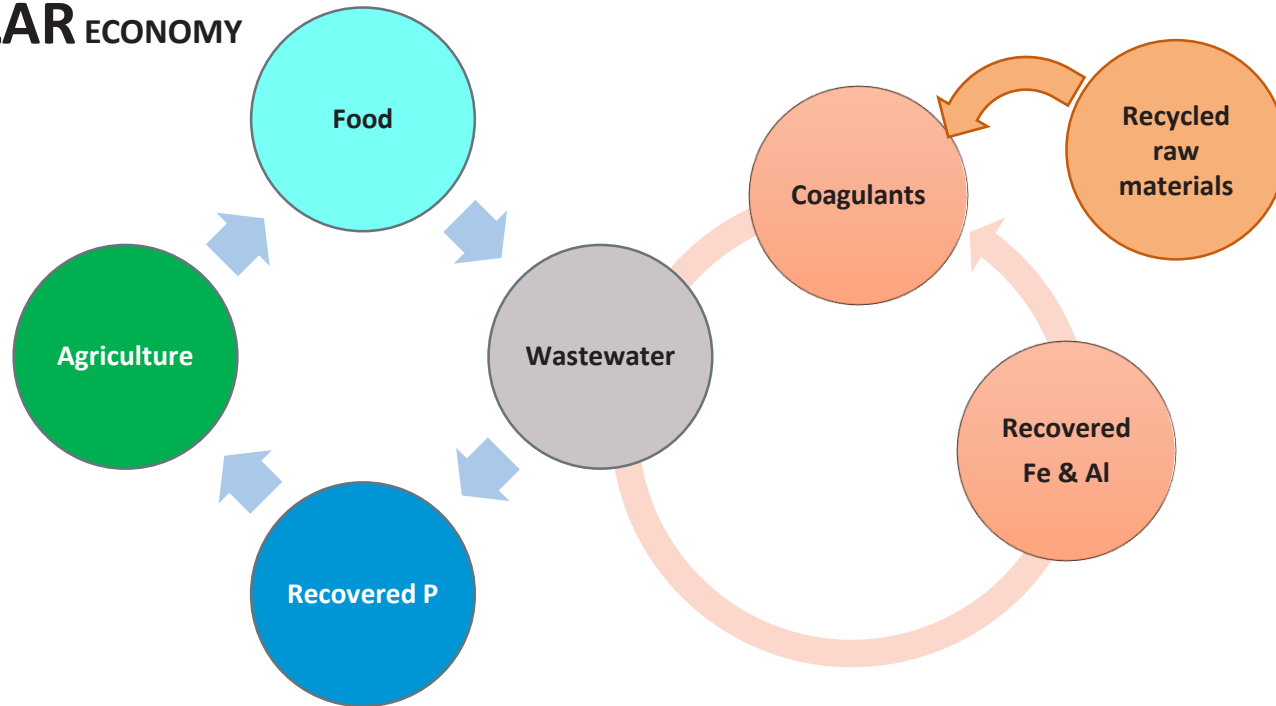


Better recycle than waste: P recovery from waste water

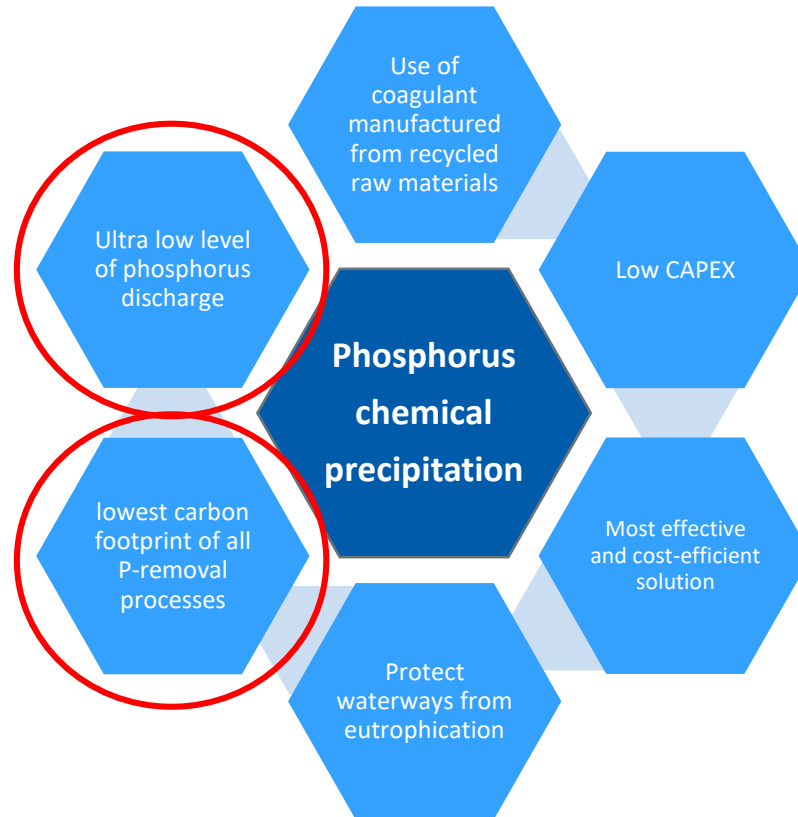
FROM A **LINEAR** WORLD



TO **CIRCULAR** ECONOMY

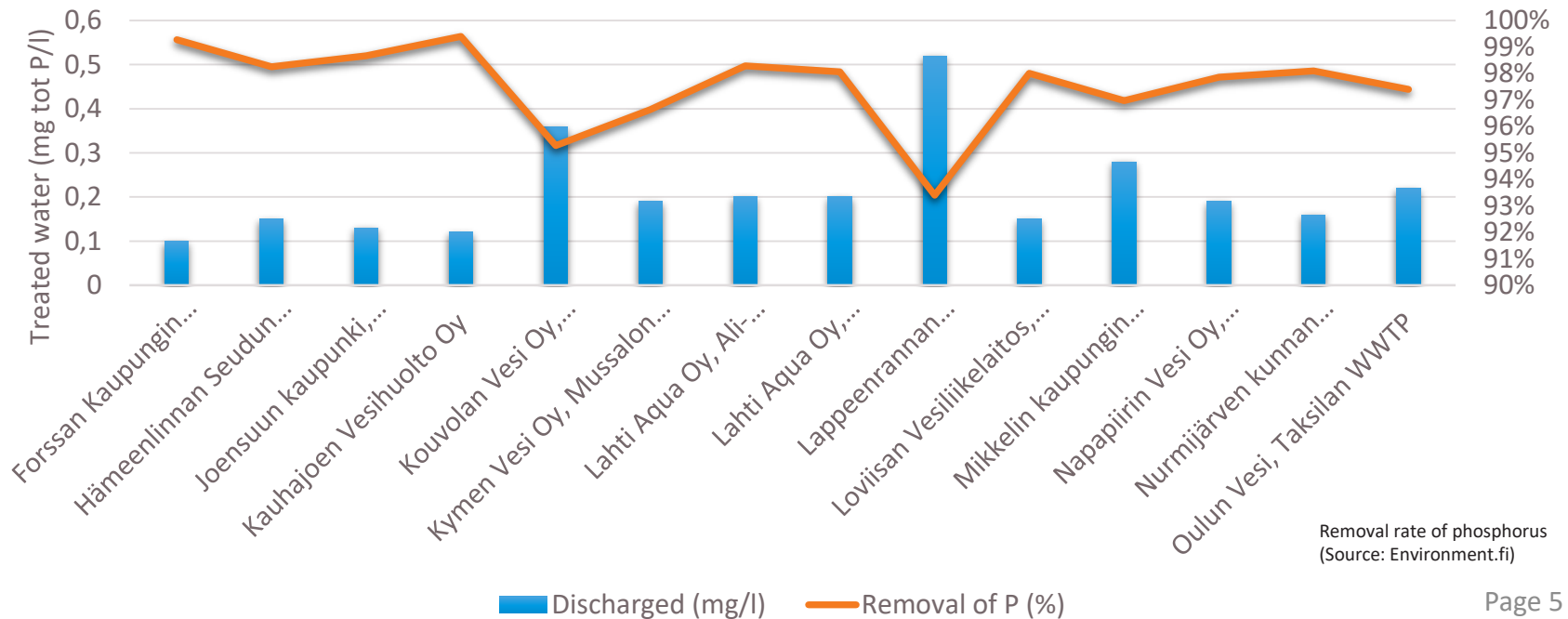


P recovery starts always with removal



Inorganic coagulants can achieve ultra low levels of phosphorus – Finnish case

Only with chemical phosphorus removal, levels below 0.2 mg/l in the effluent can be consistently achieved



Precipitation of phosphorus leads to high recovery potential as well

- From 50% to over 90% phosphorus recovery
- Phosphorus can be recovered
 - from sludge
 - from tertiary treatment unit
 - from ash
- Cost efficient solution with minor influence on OPEX, and low CAPEX requirement are available



Recovered thermally dried
aluminium phosphate

Examples of phosphorus recovery processes when using inorganic coagulants

Phosphorus recovery from sludge

- Depending on technology, iron or aluminium coagulant can be used and recovered as well
- It can be dosed flexibly to the primary, secondary or tertiary treatment
- Needs chemical extraction of phosphorus or physical separation methods or biological pathways

Phosphorus recovery from tertiary treatment

- The recovery unit is easily installed to the existing wastewater treatment plant
- Coagulant is dosed to the tertiary treatment
- Both iron or aluminium coagulant can be used and recovered as well

Phosphorus recovery from sewage sludge ash

- Normally a very high recovery yield of phosphorus
- Most extraction processes also recover aluminium and iron coagulant
- Mono-incineration of sludge required



Carbon footprint of different wastewater treatment plant configurations

Magnus Rahmberg, Sofia Andersson, Erik U Lindblom and Kristin Johansson, IVL



Scope & Effluent limits

Evaluate 3 WWTP processes from a LCA perspective:

- Pre-precipitation
- Simultaneous precipitation
- Biological P removal

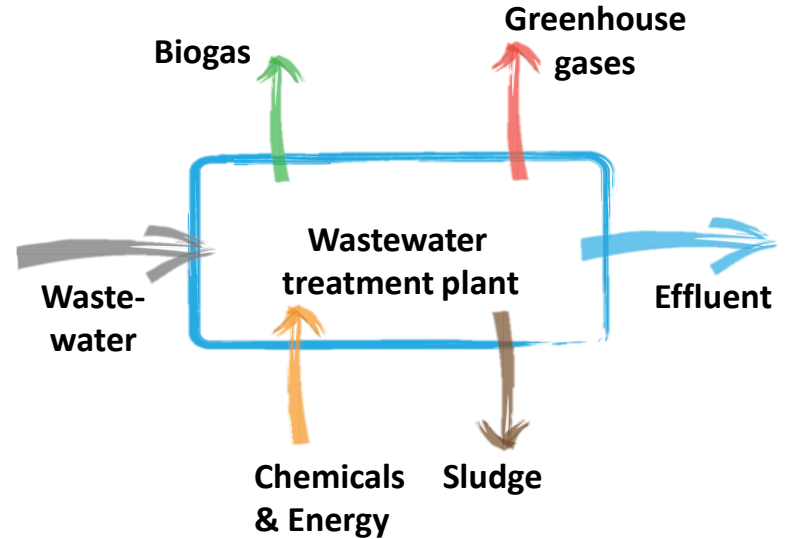
Effluent Limits

Baseline:

TP 1 mg/l, TN 10 mg/l, BOD 25 mg/l

Stricter:

TP 0.3 mg/l, TN 10 mg/l, BOD 25 mg/l



Global Warming Potential with / without coagulants



Conclusions of the IVL study



Chemical pre-treatment clearly gives a lower GWP than the other configurations



Pre-precipitation generates most biogas



Energy source important factor for several impact categories



A more stringent effluent limit leads to a higher carbon footprint

Role of inorganic coagulants in the circular economy

Inorganic coagulants used in wastewater treatment:

- Are needed to achieve ultra low levels of phosphorus discharged in the environment
- Guarantee high phosphorus recovery rate (> 50%)
- Allow higher energy recovery from organic waste and hence lead to a lower carbon footprint
- Have been part of the circular economy for many years

THANK YOU VERY MUCH!

A sector group of Cefic 

European Chemical Industry Council - Cefic aisbl

incopa