Resource Water Recycling Plant – a new paradigm for waste water treatment and nutrient recycling

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EKOBALANS

IWAMA Interactive Water Management

Interreg Baltic Sea Region

EUROPEAN UNION

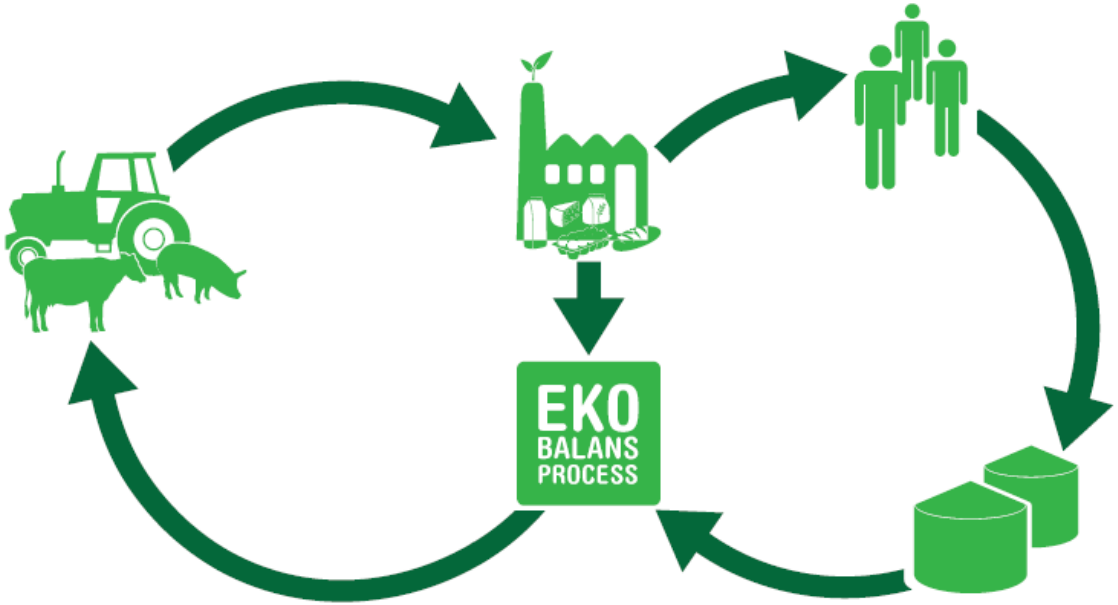
EUROPEAN REGIONAL DEVELOPMENT FUND

EkoBalans

- Sustainable solutions for the recycling of plant nutrients from food industry, biogas production, and WWTPs
- Recycled nutrients are refined into high quality fertilizers and returned to agriculture or other plant production

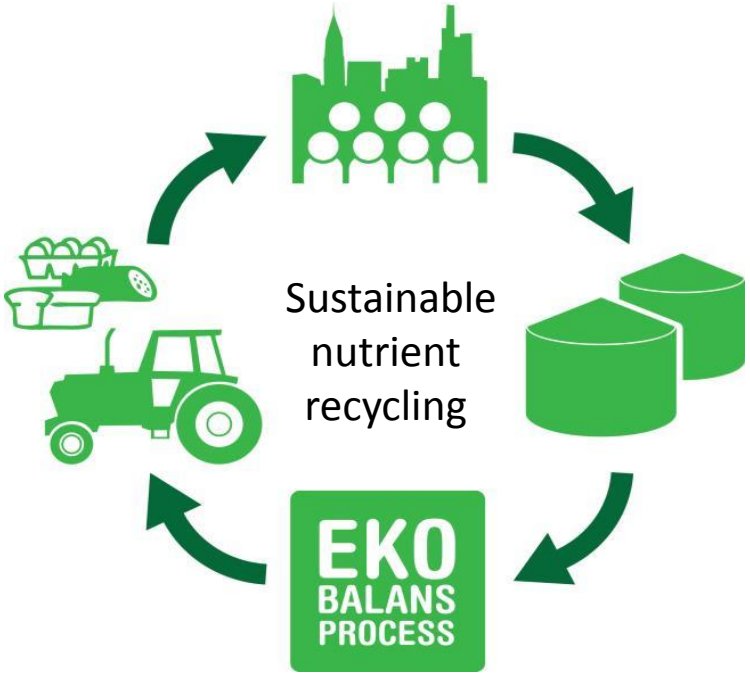
EkoBalans combines qualified expertise in plant ecology, chemical engineering, agriculture and forestry

Our vision is to complete the nutrient cycles by closing the loops for nutrients such as phosphorus and nitrogen



EkoBalans solutions for sustainable nutrient recycling

- eco:P - Phosphorus extraction as struvite ($MgNH_4PO_4*6H_2O$)
- eco:N – Nitrogen extraction as solid ammonium sulfate $(NH_4)_2SO_4$
- eco:S – Drying and pyrolysis of sludge and other organic residues with cadmium removal
- Fertilizer production from extracted nutrient fractions
- Resource Water Recycling Plant – RWRP instead of WWTP



Wastewater contains resources:

- Energy / organic material
- Plant nutrients

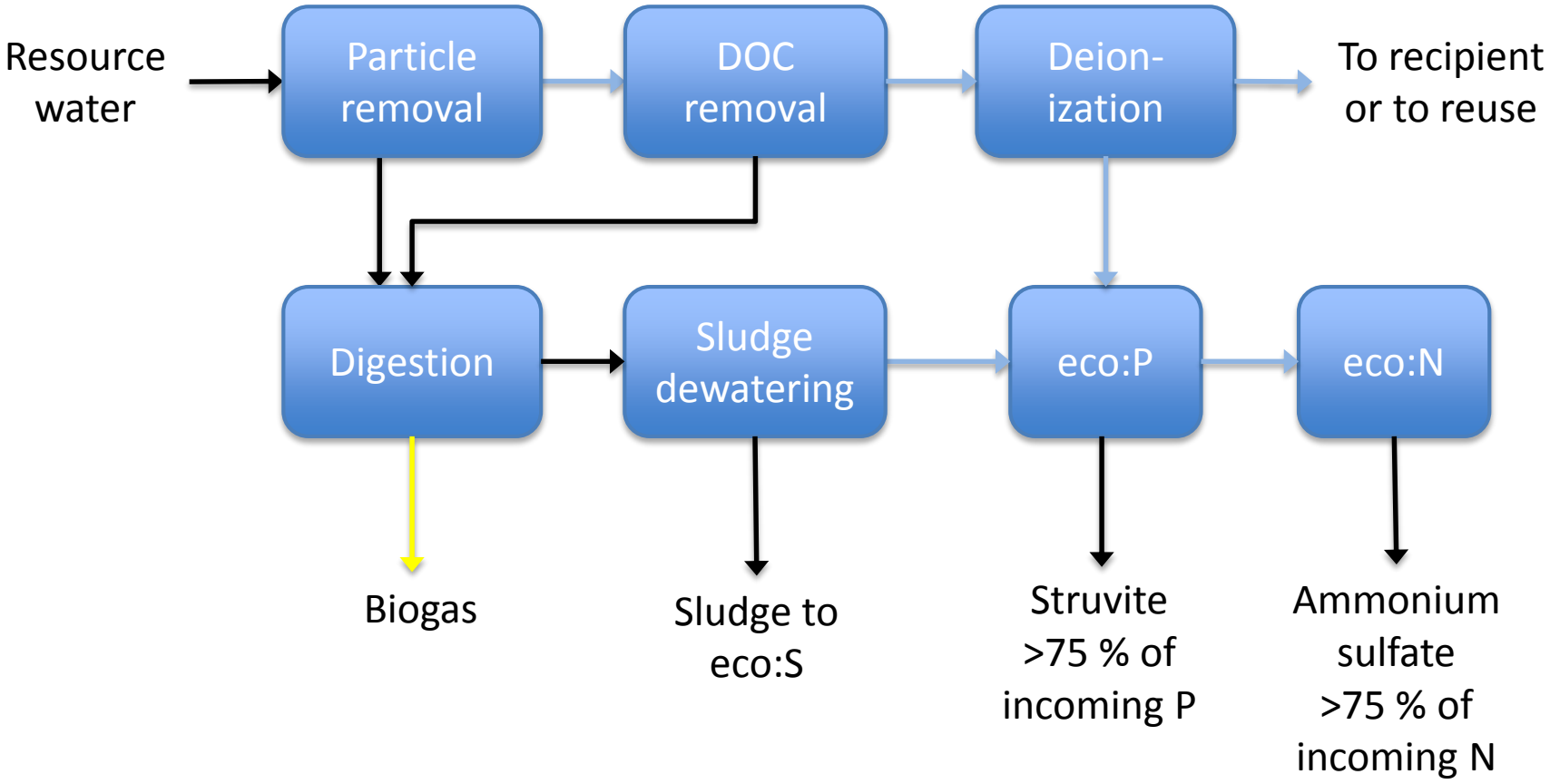
- Water

Resource water!

= A new paradigm for residual flows

RWRP – Resource Water Recycling Plant

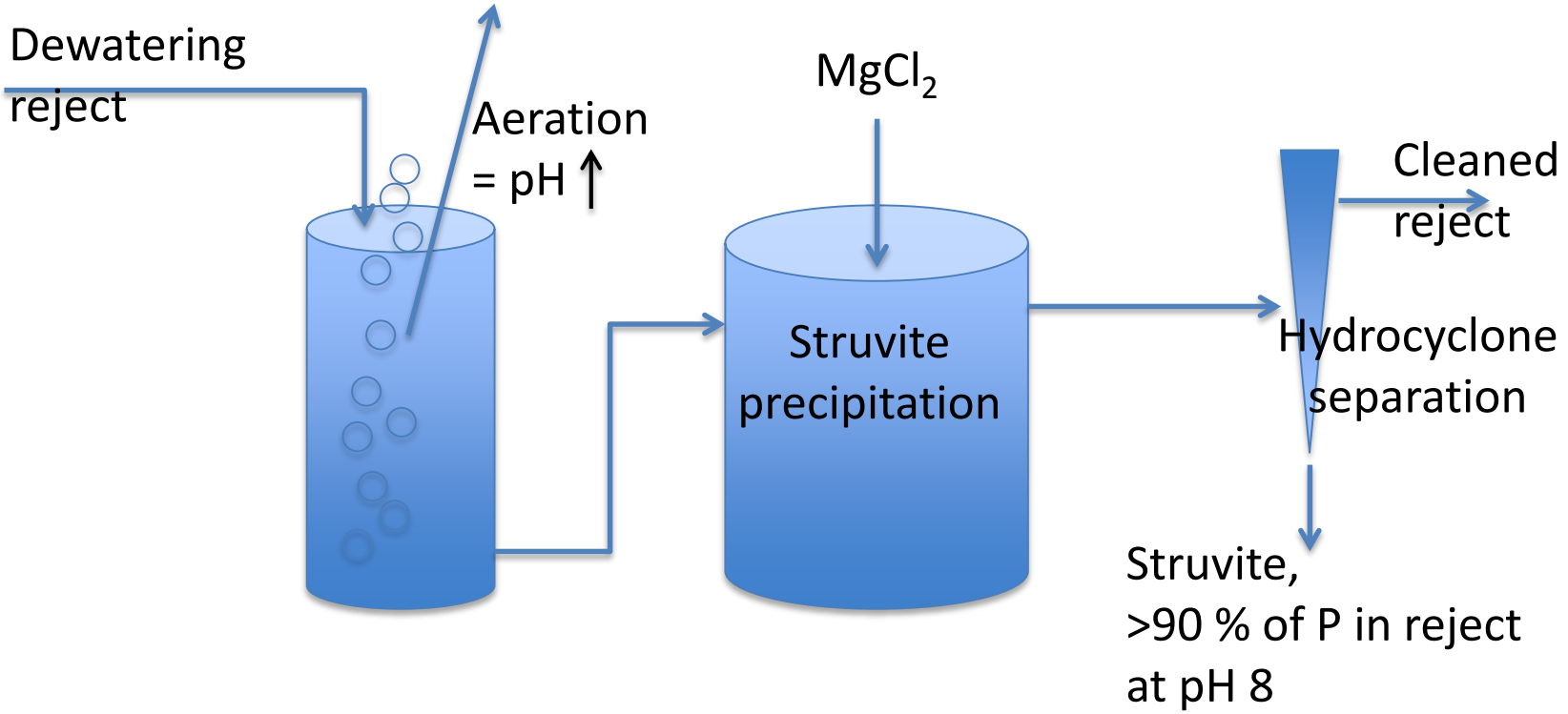
combining eco:P and eco:N with other technologies to maximize nutrient recycling and minimize resource consumption and climate impact



The eco:P process

- Batch-baserad struvite precipitation with very short retention time *and* high recovery = small footprint
- Separation of micro crystalls with EkoBalans proprietary harvesting technology

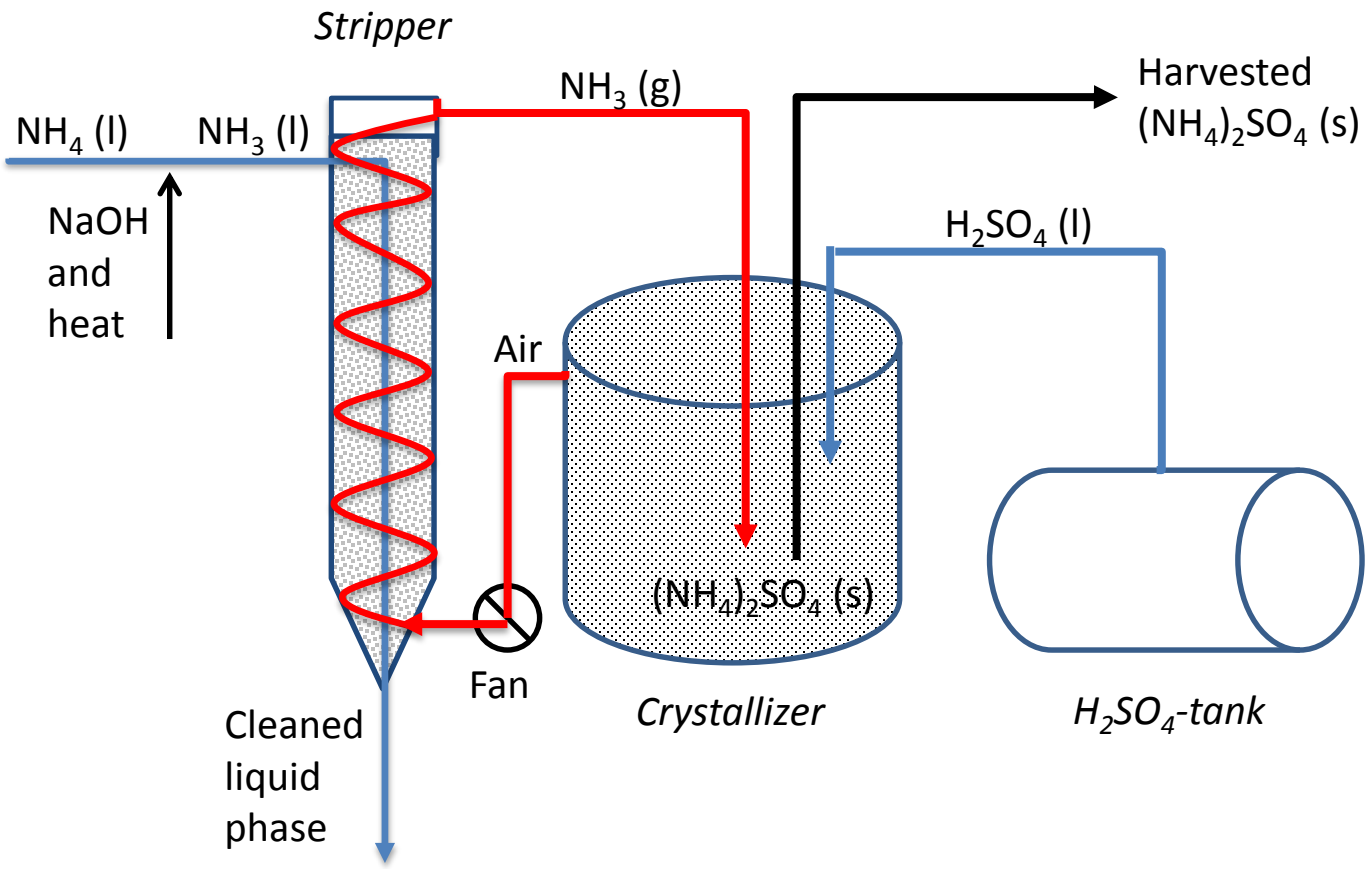
The eco:P process



eco:P-extracted struvite

- Microcrystalline powder
- Spreadable as is or raw material for fertilizer production
- 12,5 % P; 5,5 % N; 9,5 % Mg
- High nutrient plant availability
- Organic content usually <1 %
- Cd usually below detection limit
- Other heavy metals in lower concentrations than in artificial fertilizers

The eco:N process



eco:N: stripping + small scale crystallization + crystall harvesting

eco:N-extracted ammonium sulphate

- Approx 1 mm crystalls
- Spreadable as is or raw material for fertilizer production
- 21 % N; 24 % S
- High nutrient plant availability
- Organic content usually <0,1 %
- Heavy metals in lower concentrations than in artificial fertilizers

EkoBalans fertilizer products

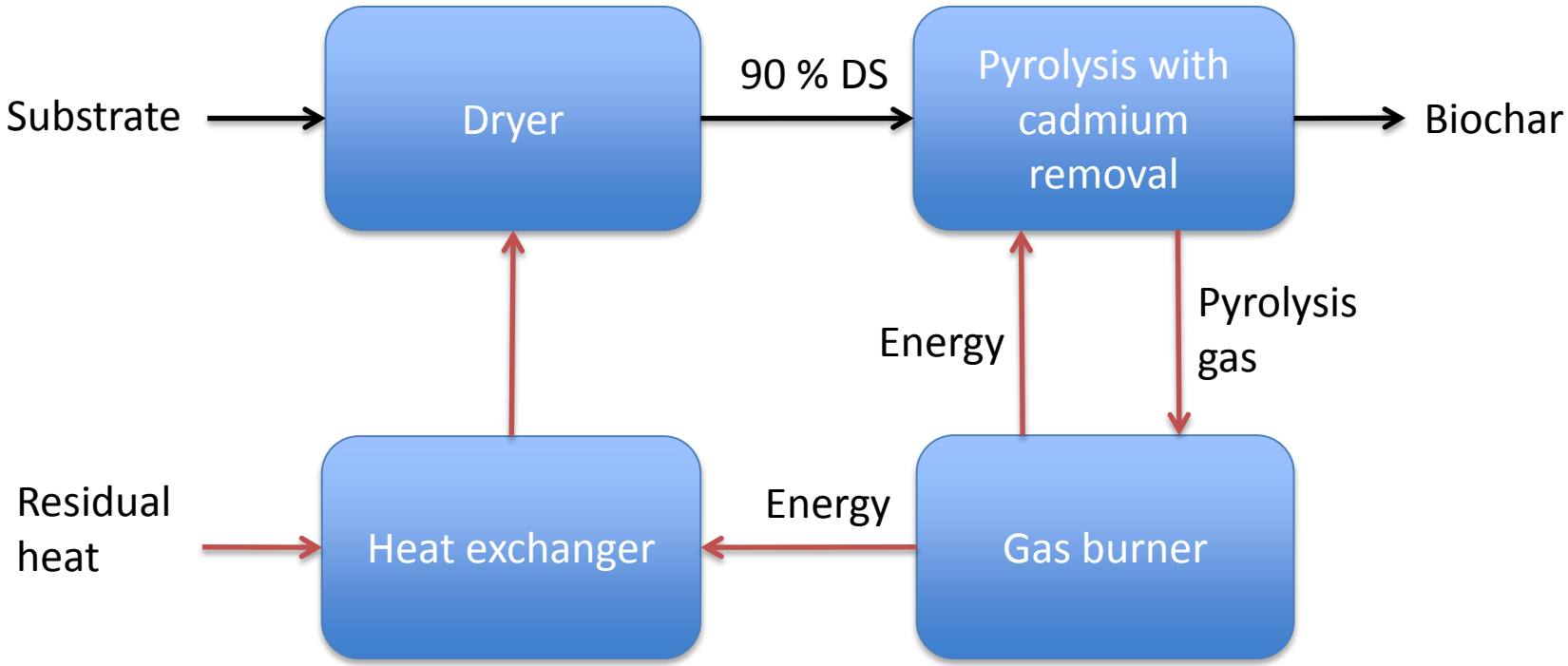
- Recycled P and N from the eco:P and eco:N processes
- NPK-mix can be customized
- Artificial fertilizer quality
- No contaminants

Benefits of RWRP

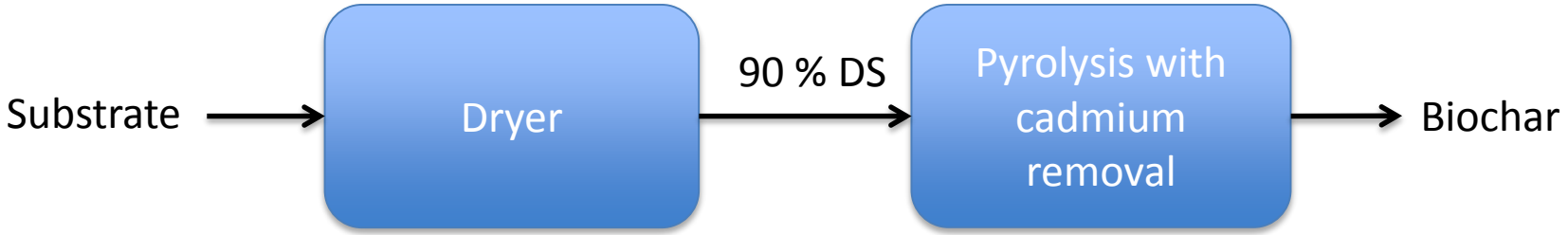
- ✓ >75 % recycling of both P and N, free from pollutants
- ✓ Energy positive and climate positive
- ✓ More gas and less sludge
- ✓ No precipitants
- ✓ Simplified cleaning process - no return sludge, less dependence on sensitive biology
- ✓ Minimized footprint

What about the sludge?

The eco:S process



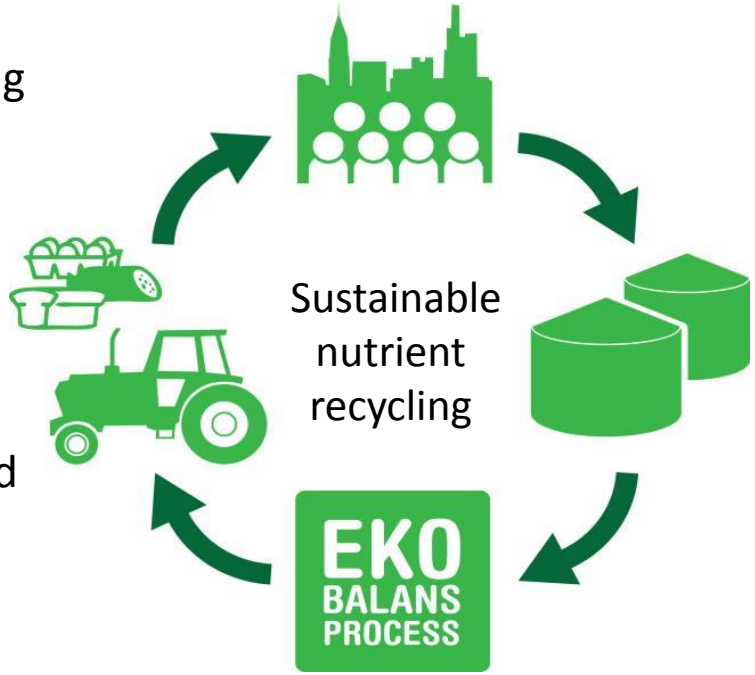
eco:S



- >90 % of cadmium removed, pilot scale verified
- Pathogens and organic pollutants are destructed
- Flue gas cleaning simple
- Biochar more valuable than ashes
- Technologies for drying and pyrolysis are available
- Much cheaper than sludge incineration + P extraction from ashes

In summary

- With eco:P phosphorus can be recovered as struvite
- With eco:N nitrogen can be recovered as ammonium sulfate
- Struvite and ammonium sulfate can be combined into high quality fertilizers that can replace artificial fertilizer improving the likelihood of successful local recycling
- In a Resource Water Recycling Plant (RWRP) N and P removed from the main stream by deionization and N and P in sludge dewatering reject is recovered with eco:P and eco:N resulting in >75 % total recovery of N and P
- The RWRP is energy and climate positive and footprint is minimized
- With eco:S sludge cadmium can be removed effectively
- With eco:P + eco:S all incoming P can be recycled as fertilizer and biochar respectively



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