

SUSTAINABLE

Airport cities

Closing the phosphorus cycle at Amsterdam Airport Schiphol



Transition

Taking the right steps now to achieve a sustainable water cycle

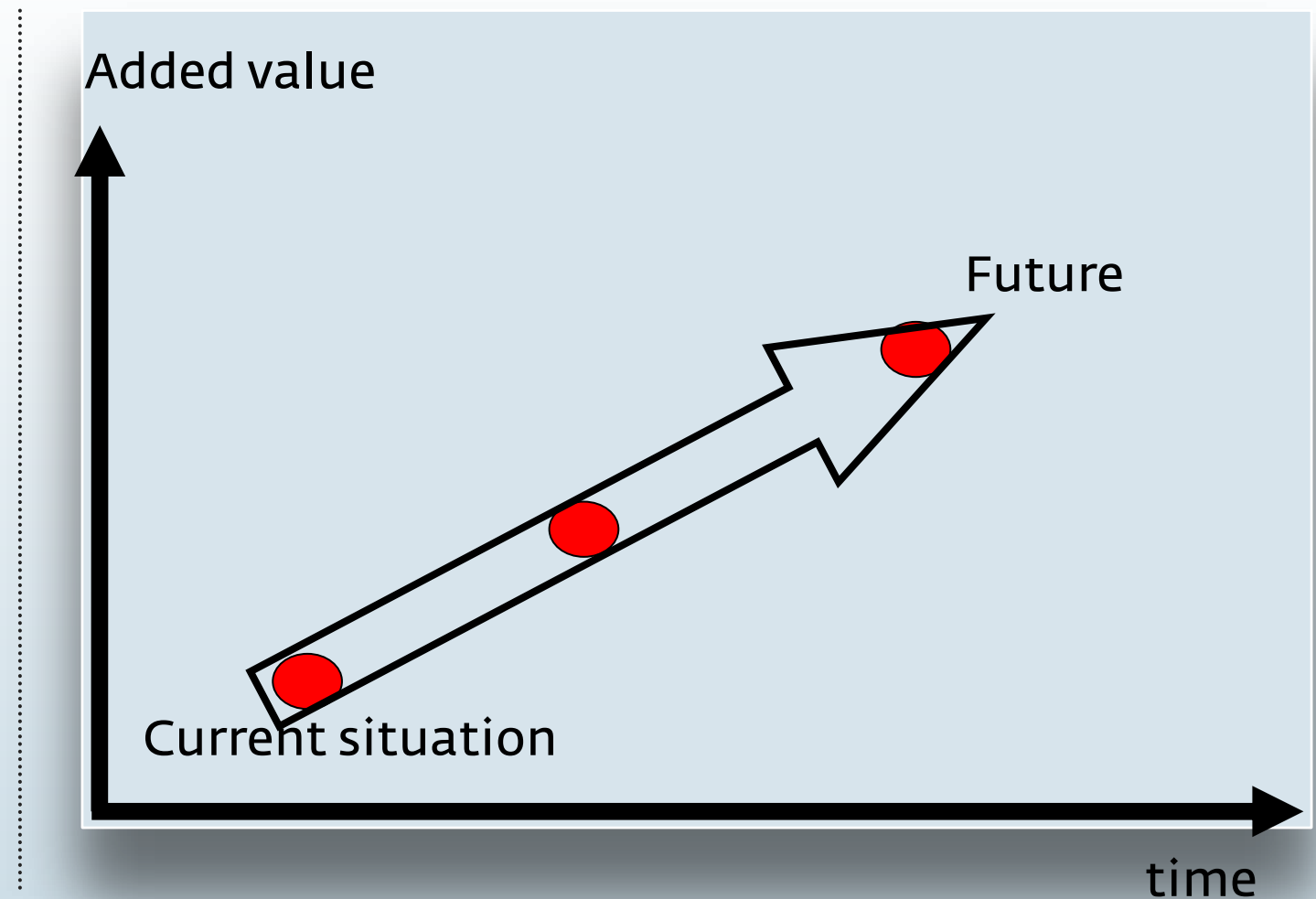
Valorisation

Resources

Adjusting/replacing existing infrastructure

Focus on one aspect

→ Schiphol: phosphorus recovery



Phosphorus is essential for life

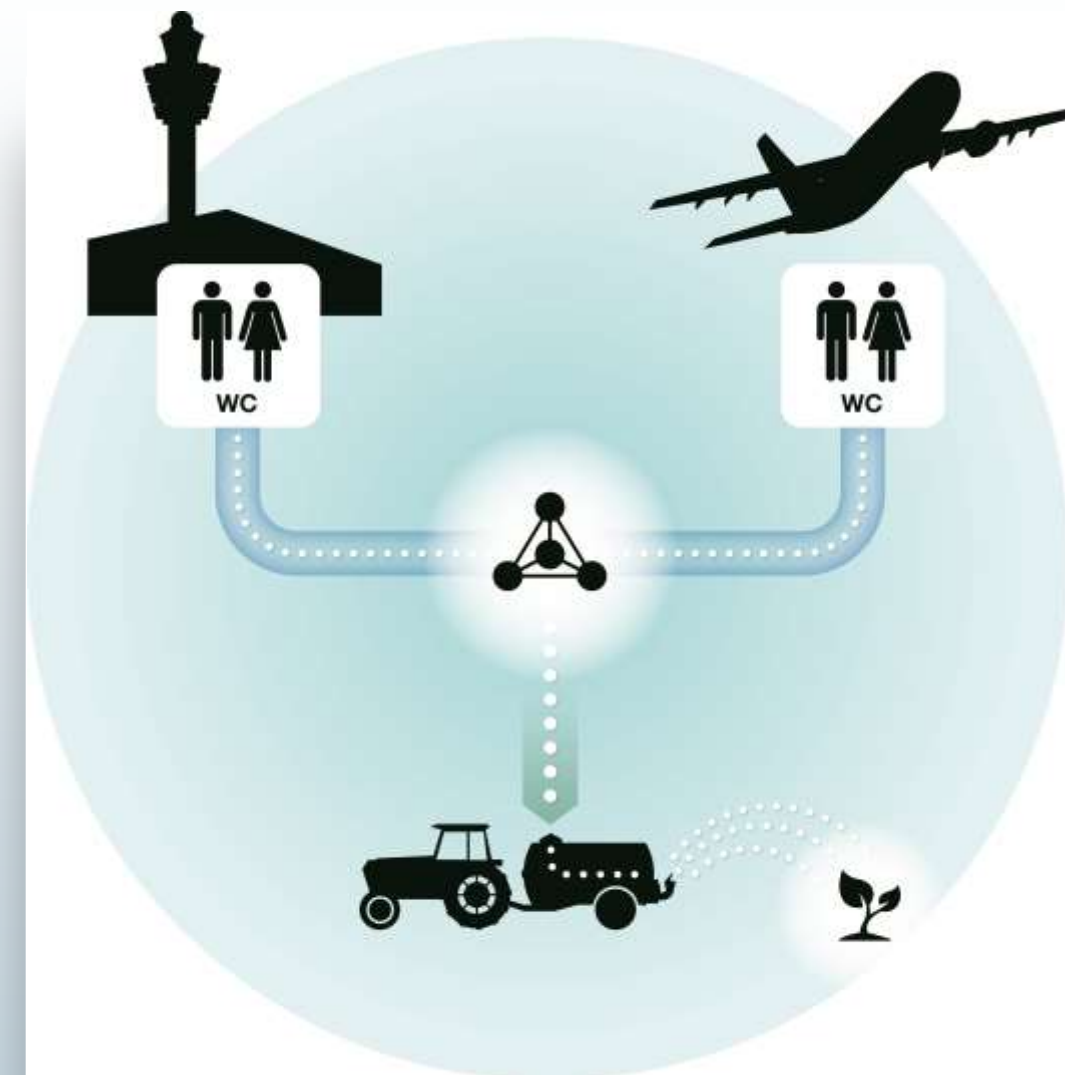
Schiphol as a unique place for demonstration

Schiphol Amsterdam airport:

- 50 million travellers yearly
- Possibility to replace artificial fertilizer

Goal:

- Show innovative watertechnology that converts wastewater into sustainable fertilizer and use sustainable fertilizer at Schiphol Airport premises
- Enhance sustainable development via cooperation between water and aviation sectors



Sustainable airport cities

Deliverables en method

Deliverables:

- Showcase phosphorus recovery with local reuse
- Increased sustainability of the (waste)water cycle of Schiphol Amsterdam Airport:
 - Smaller environmental footprint of the waste water treatment process
 - Reuse of recovered phosphorus as fertilizer
 - Lower CO₂-emissions and water use for fertilizer product

Method:

- Development of business case
- Construction of a pilot plant at WWTP Schiphol
- Local application of the recovered phosphorus



WWTP Schiphol

45.000 p.e.

Operated by Evides Industriewater

Activated sludge without primary clarification

Chemical phosphorus removal

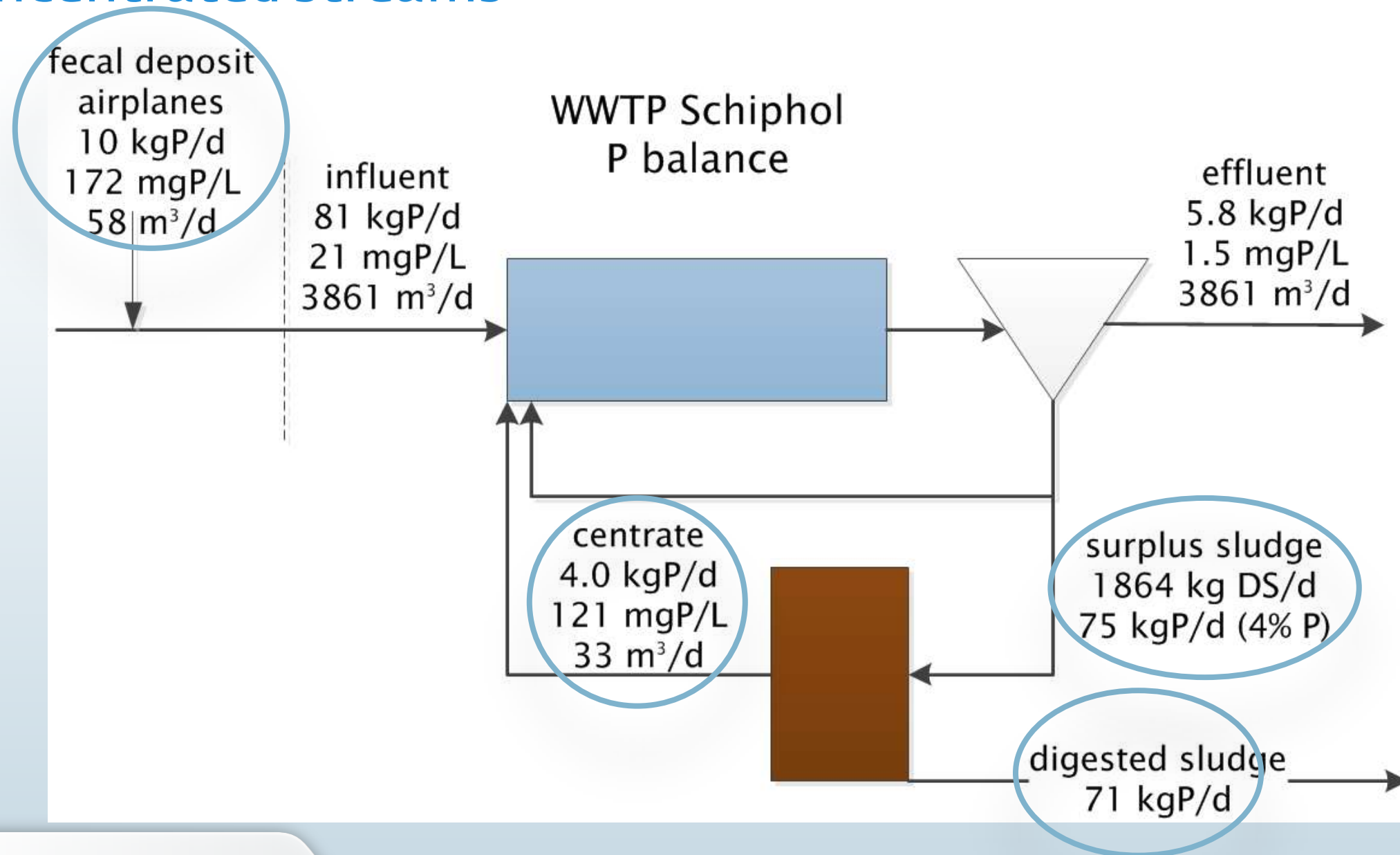
Sludge digestion on site



WWTP SCHIPHOL

P balance at WWTP Schiphol

Several concentrated streams



Struvite pilot installation

Pilot: stripper 6.8 m³ and reactor 9.3 m³

6 – 12 m³/hr

Three different streams will be researched:

- Sludge liquor / centrate
- Fecal deposit from airplanes
- Digested sludge

Potential:

4 ton P / year (= 32 ton struvite per year)

(Schiphol fertilizer use 1 – 8 ton per year)



STRUVITE PILOT INSTALLATION AT WWTP SCHIPHOL

Results

Struvite from centrate

- 12 weeks of operation
- 440 kg struvite harvested of which 240 kg is used as ent material for next phase
- Very fine material (< 0.5 mm)
- In the last weeks production was limited by low P concentration in centrate due to extra iron dosing in main process (needed to achieve discharge limits)



STRUVITE HARVESTED



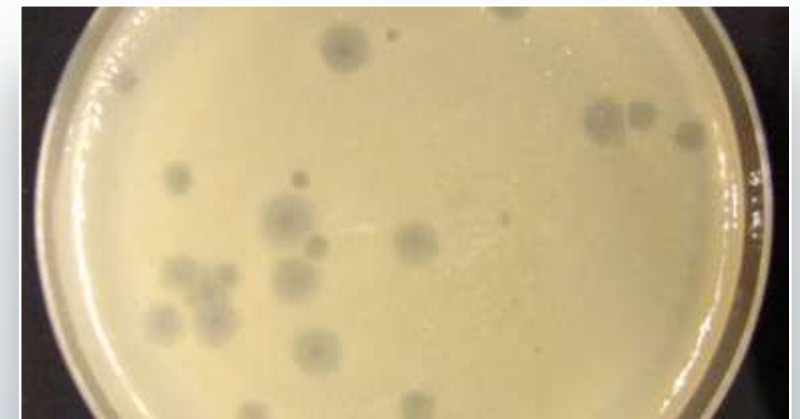
Quality of struvite

What counts is its quality not its origin

The following analyses will be done:

- Standard analyses to quantify amount of P, Mg and N
- Heavy metals (table 1 of Dutch fertilizer law)
- Organic micropollutants (table 4 of Dutch fertilizer law)
- Pathogens: first results show low concentrations, very low e.g. compared to European regulation for animal by-products
- Hormones and medicine residues: screening with advanced equipment

BACTERIOPHAGES



SULPHATE REDUCING CLOSTRIDIA SPORES

Application of the recovered phosphorus

Struvite as a slow release fertilizer

- Legislation in the Netherlands is changing: several types of struvite (e.g. from different waste streams) will be allowed as fertilizer, quality of struvite is important
- At the moment research on pathogens and hormones and medicine residues in struvite products (by KWR).
- Next year March application of the produced struvite on Schiphol premises, provided that struvite is clean, safe and allowed by law.

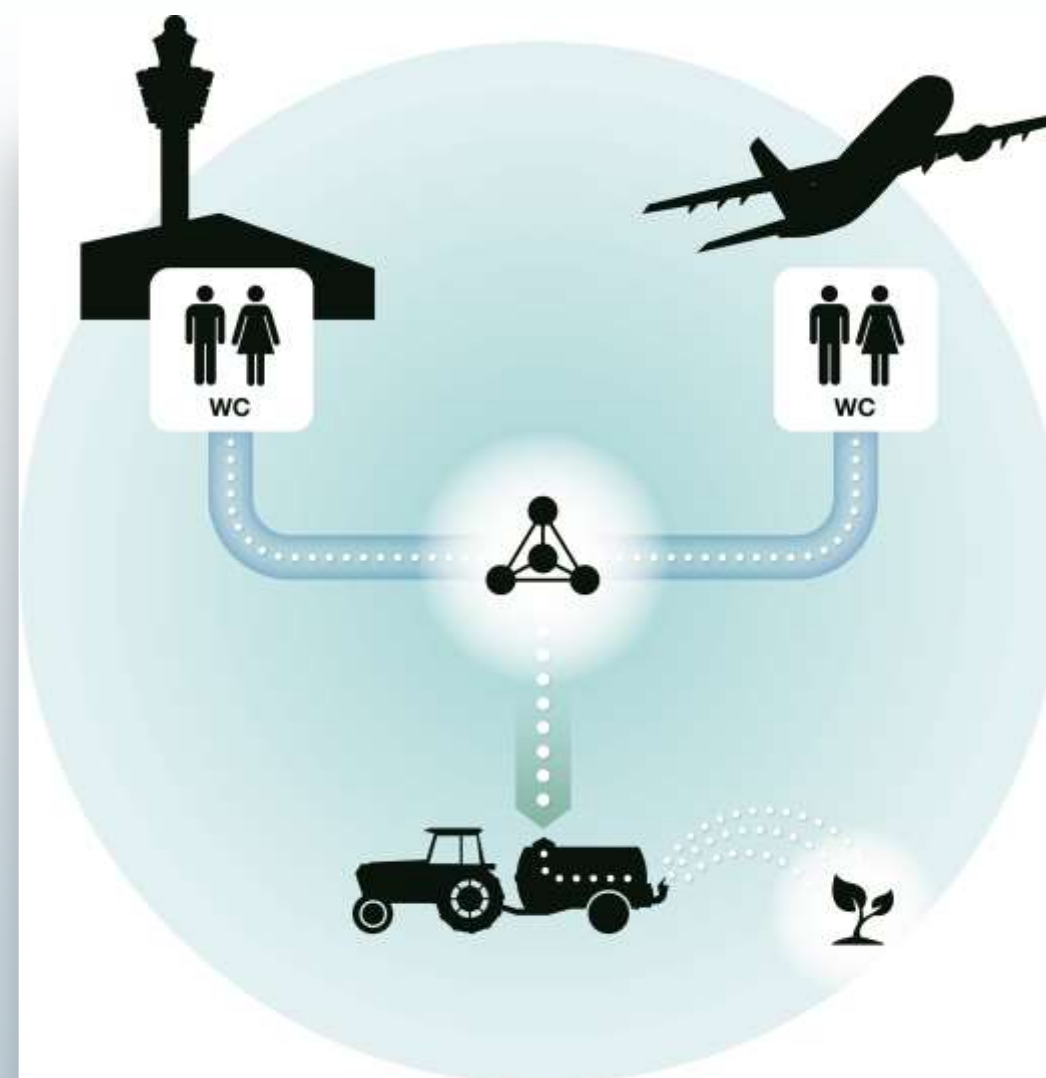


Sustainable airport cities

Concluding remarks

Showcase phosphorus recovery at Schiphol
Recovered phosphorus locally applied as
fertilizer: cycle closed

First step towards a sustainable water cycle



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