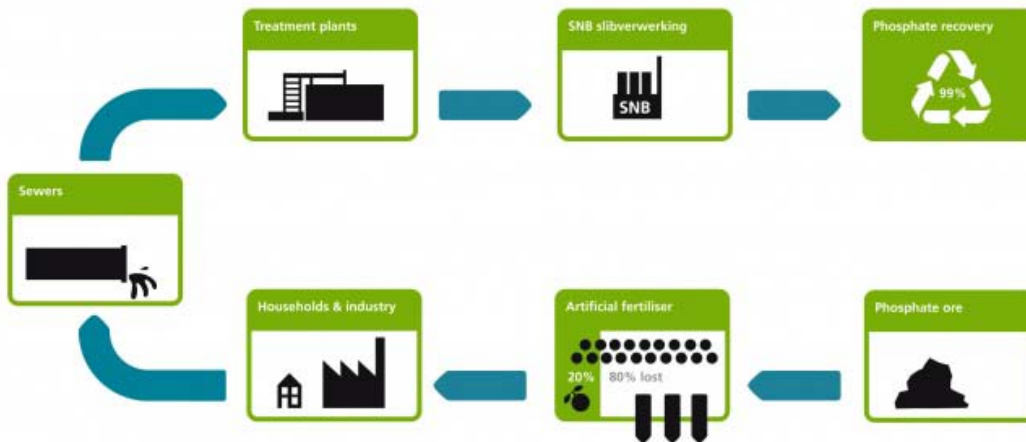


Recycling of phosphate from waste water in The Netherlands

Leon Korving, Slibverwerking Noord-Brabant, The Netherlands



End of the line?
Not at all



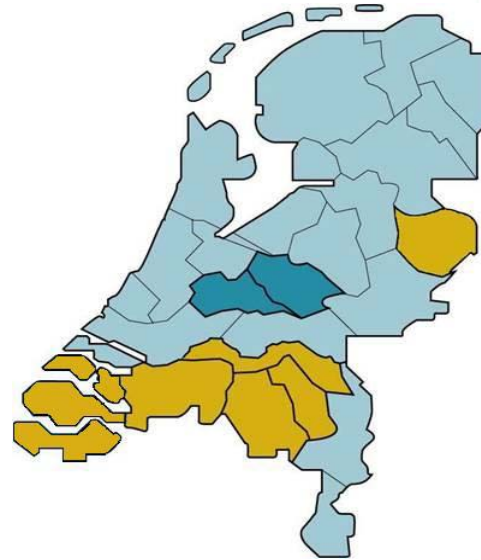
Contents

- SNB and phosphate recycling
- Numbers
- Policy
- Developments:
 - New sanitation
 - Recovery at WWTP
 - Via sludge ash
- Conclusion



SNB – Slibverwerking Noord-Brabant

- Incineration of sewage sludge
- Treatment of 30% of all sewage sludge in The Netherlands:
- Capacity: 100 000 t dm/year
= ca. 8 million people equivalents
= 3 500 t P/year
- Non-profit, shareholders: 7 waterboards
- One of the largest sludge incinerators in Europe



SNB and phosphate recycling

- 30% of all P in sewage sludge in NL arrives at SNB
- SNB sees a large potential in recovery of P from sewage sludge ash:
 - Large volumes
 - High P-concentration
 - Point source
- Strategic goal: 100% P recycling by 2015
- Website: www.phosphaterecovery.com



SNB
PHOSPHATE RECOVERY



End of the line?

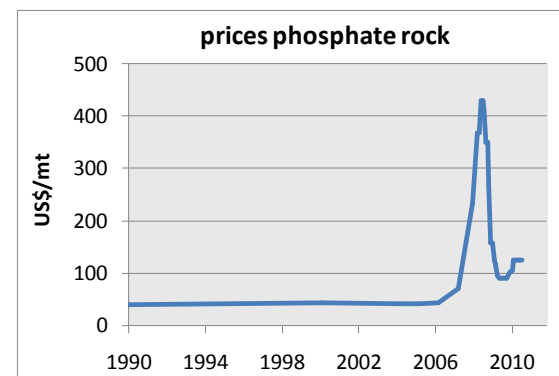
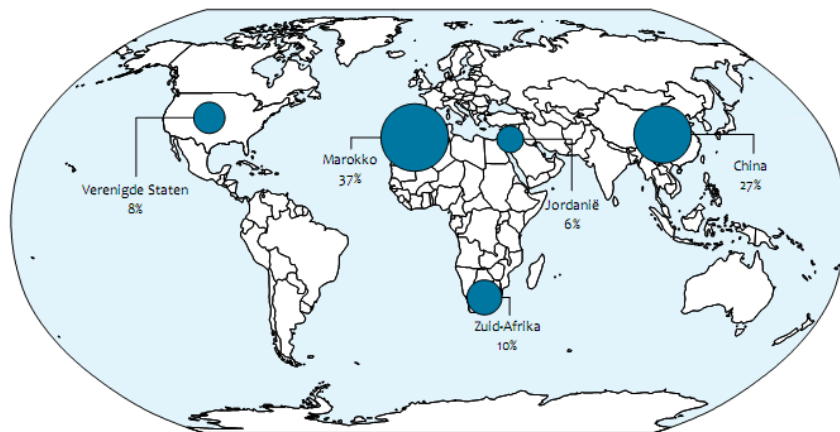
Not at all



www.phosphaterecovery.com

Reasons for phosphate recovery

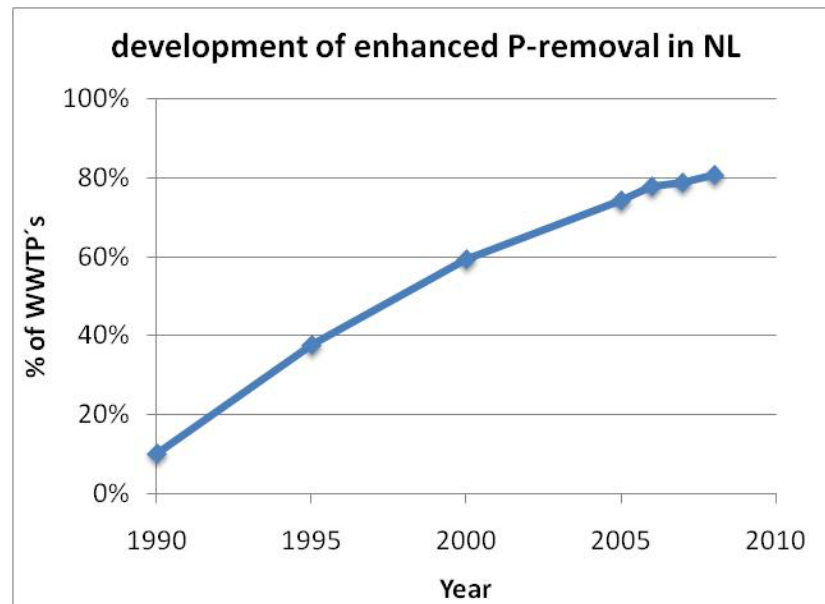
- Scarcity, resources for 30-300 years
- Strategic
 - world market is dominated by few producers
 - Europe has no significant resources
- Environmental
 - Mining of phosphate ore has environmental impacts
 - Waste production of fertilizer production
 - Heavy metals (Cd & U) in phosphate ore
- Financial



Phosphate in waste water






Netherlands: 350 WWTP's
24 million people equivalents

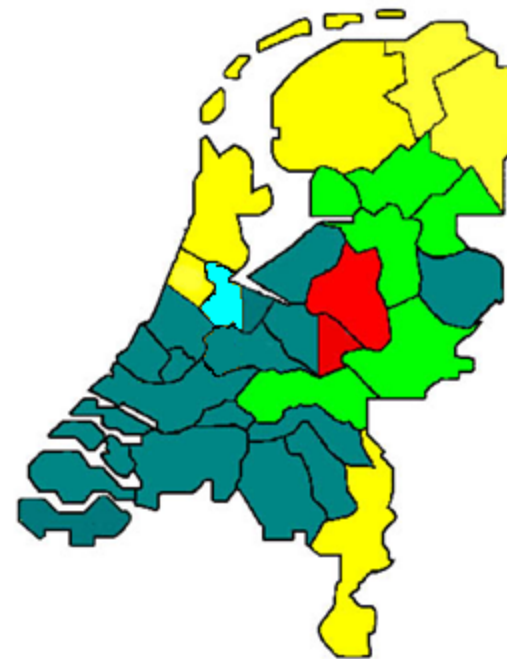
83% of P in municipal waste water is removed: 11.600 ton P



Sludge treatment in The Netherlands

Methods for sludge treatment:

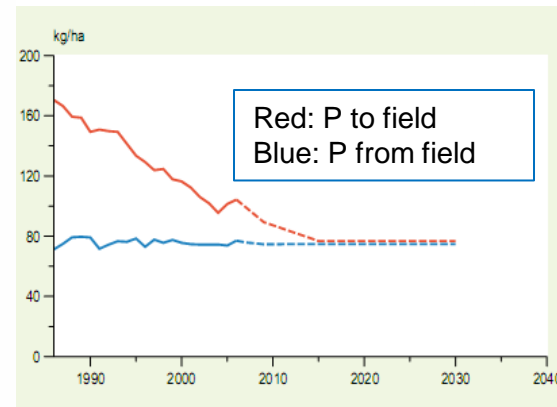
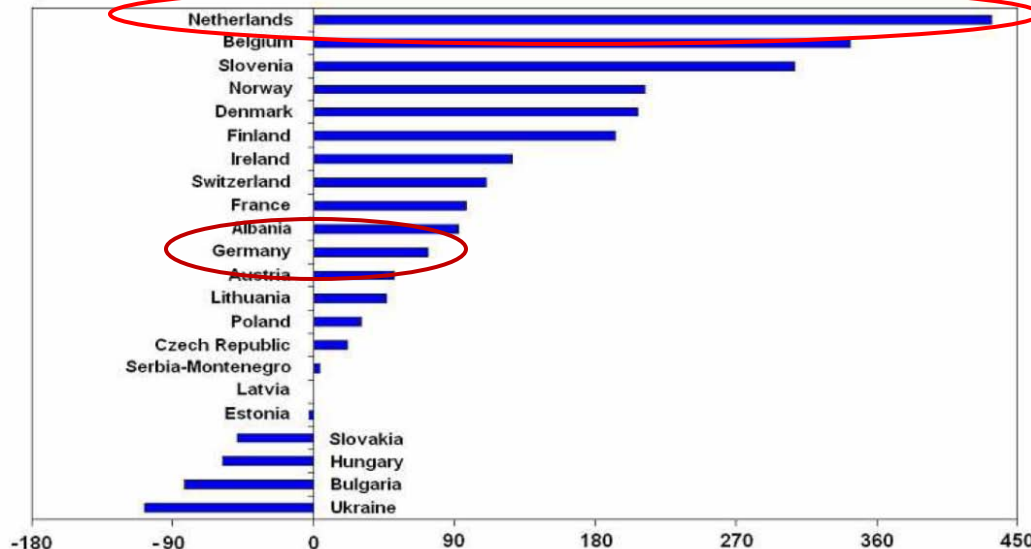
-  Mono-incineration (50%, 2 facilities)
-  Drying and co-incineration in cement kiln (25%, 7 drying facilities)
-  Composting (biological drying) and co-incineration in coal fired power stations (14%, 2 composting facilities)
-  Co-incineration in MSW incinerator (7%, 1 facility)
-  Export to Germany (5%)



Phosphate in agriculture

Since 1995: ban on use of sewage sludge as fertilizer

- Fertilizer usage: 17 kton P (2006)
- Manure: 78 kton P (2006)
- Sewage sludge: 12 kton P (2004)



P balance NL

P (kg/ha) on agricultural land in EU, cumulative 1995-2005
[Csathó, 2007]

Phosphate recovery - policy

Main concern is P surplus in surface water

Central government: no specific policy on P-recovery

Interdepartmental working group “Scarcity & Transition”

2009: Independent advisory committee to the Ministry of Agriculture warned for P-shortage

2010: P-recovery is mentioned as a goal in a “Climate agreement” between waterboards and central government. No figure mentioned

Stakeholders initiative

Since 2009, Nutrient Flow Task Group (NFTG)

Nutrient platform brings parties together in a action learning process

- Not: Applied research NGO's lobby Policy makers Business

NGO's lobbyist

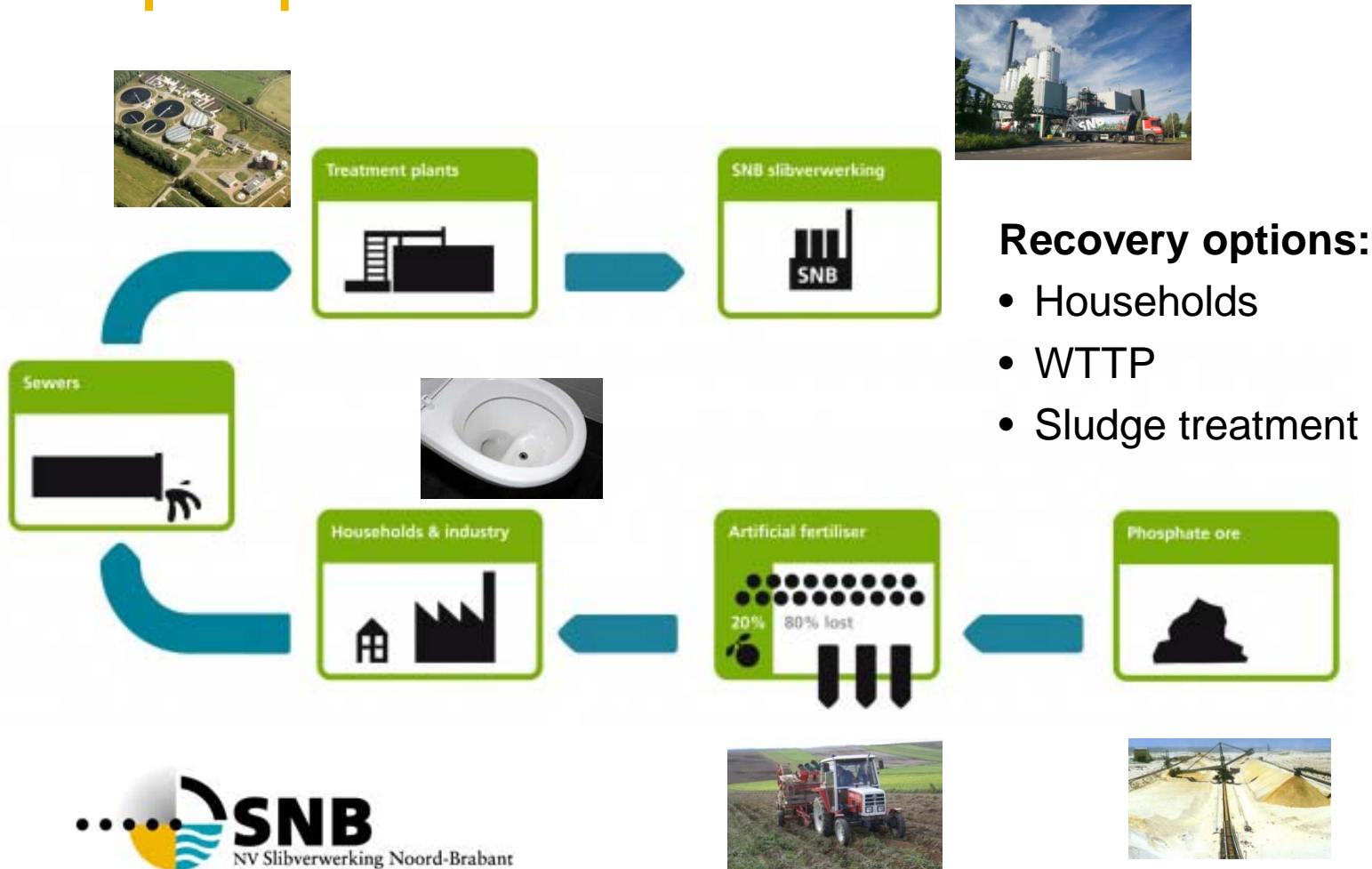
Bottom-up

- But: Applied research Policy makers

Businesses

Awareness
Networking
Lobbying

The phosphorous chain



Households: new sanitation

Coordinating advisory committee with STOWA (Dutch DWA):

- waterboards
- Universities (Delft, Wageningen, Wetsus)
- Sewer-organization

Ca. 17 projects on new sanitation

Important driver: medicine & hormone destruction

Mostly small scale 2-125 toilets/project, most important:

- DeSaH, Sneek
- Saniphos, Zutphen



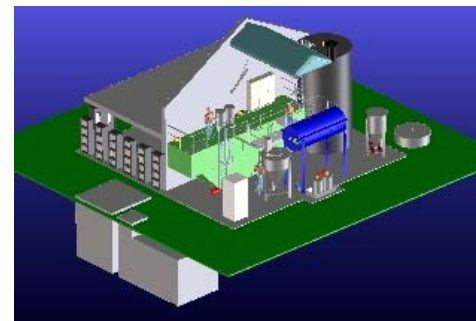
New sanitation – DeSaH Sneek

Since 2006: 32 houses:

- Vacuum toilets
- Black water (urine & faeces)
- “Garage” treatment

Biogas production for hot water
Struvite production as fertilizer
Oxidation of micro pollutants

2010: expansion tot 232 houses
2,5 million euro investment



New sanitation – SaNiPhos



“Urine factory”, October 2010 in operation

Treatment of source separated urine
5000 m³/year ~ 10.000 people equivalents

20% from “mothers for mothers”, urine from pregnant women for hCG-hormone

Production of struvite & ammoniumsulfate
Pilot test: adsorption of micro pollutants



Recovery at Waste Water Treatment Plant

Vision 2030:

Increasing importance of recovery of **Nutrients, Energy & Water**

WWTP becomes NEW-factory

Important stimulus for nutrient recovery & framework for future research



WWTP: Geestmerambacht

One of the first examples of phosphate recovery, 1993-2010

Dutch Crystalactor®-technology (DHV)

Recovery of phosphate in P-rich side stream

Production of calciumphosphate (13 ton P/year)

Expensive & recently closed down

New development (pilot tests):

Struvite production in Crystalactor

Production of ammonia from struvite

Energy production in fuel cell from NH_3



WWTP: developments

Focus in WWTP: struvite production

Most suitable for biological phosphate removal: (25% of WWTP's) and recovery is 40-60%.

WWTP Emmen: since July 2010 first full scale struvite production (German AirPrex technology)

Also projects under consideration for Ostara process (Canada)



Recovery from sewage sludge ash

Large potential for recovery of P via sludge ash:

- Large scale incineration of sewage sludge
- SNB collects P from 8 million people equivalents
- Saving: ca 400-600 euro/ton P
- Technologies for P-recovery are available:
 - Thermphos
 - Thermo-chemical
 - Wet-chemical
- Objective: 2015 full scale phosphate recovery



Recovery of P via Thermphos

Thermphos Vlissingen:

700.000 ton/year phosphate rock into P_4

Wishes to replace 20% by alternative P-sources

Sewage sludge ash can be alternative for phosphate rock

But: iron concentration not acceptable

Solution: selective incineration

On 1 of 4 incineration lines

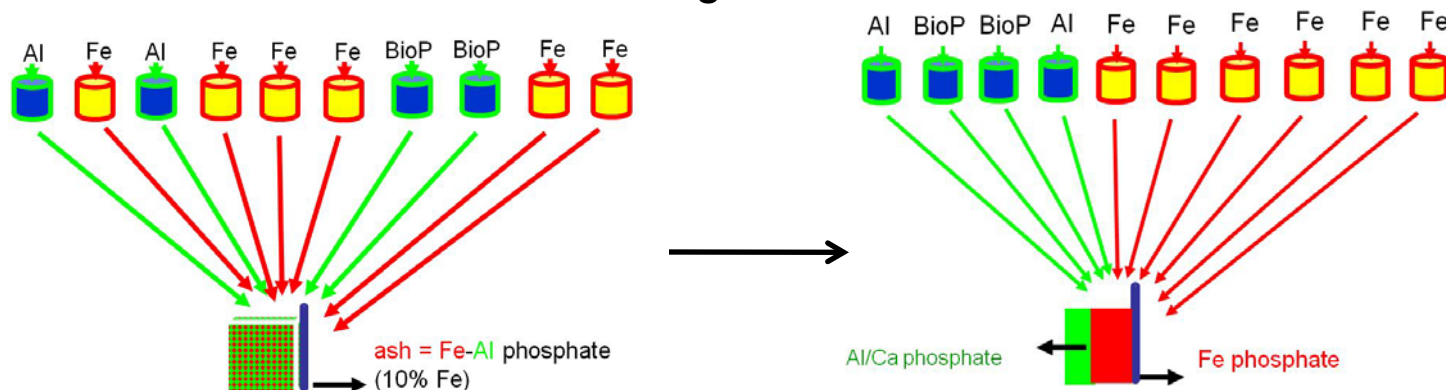
8000 t ash/year = 800 t P/year

1,9 million people-equivalents



Recovery of P via Thermphos

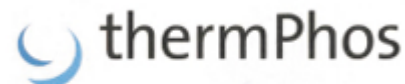
Selective incineration of sludge:



First tests in 2006 & 2007

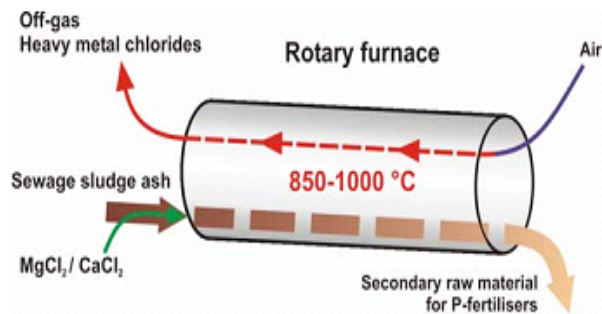
Continuous production 2008 & 2009

2010: temporary stop



Recovery of P: thermo-chemical

Thermo-chemical treatment of ash to produce a fertilizer



SNB participated in European SUSAN project with German & Austrian partners (BAM Berlin, FAL, Ash Dec)

First plant to be realized in Berlin, Second in NL?



Recovery of P from ash: wet-chemical

SNB evaluates two proprietary wet-chemical processes

Processes developed for low quality phosphate ores:

- Ecophos (Belgium)
- Easymining (Sweden)



Products:

- water soluble phosphates (MCP, DAP)
- flocculants (Fe and Al-salts)

Mass balances proved on lab-scale: ready for scale-up



Conclusion – The Netherlands

- Surplus of phosphate is primary problem
- Central government has no policy for recovery
- Increasing awareness in water sector for phosphate recovery
- Networking platform for phosphate in development
- Research is focused on new sanitation
- Until now: mainly imported technologies
- Willingness to be “launching customer”
- Large scale incineration of sludge: unique opportunity for low cost phosphate recycling

More information

More information on SNB:

www.snb.nl

More information on SNB and/or
phosphate recovery:

www.phosphaterecovery.com

