National inquiry on Circular and non-toxic reuse of Phosphorus from sewage sludge

Folke K Larsson, Sludge workshop, Luleå 2020-03-13

Inquiry organisation

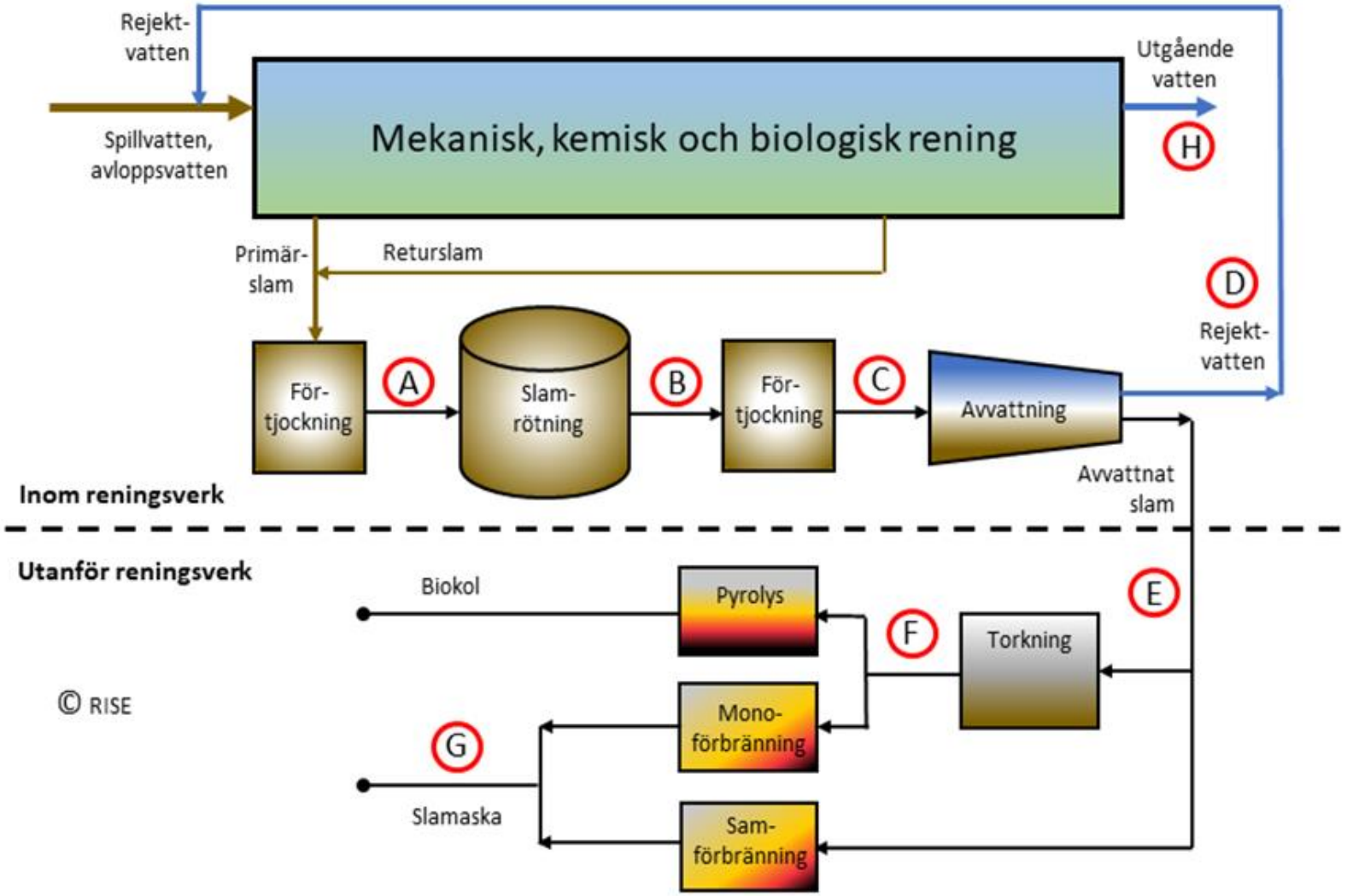
- Chair: Gunnar Holmgren
- Secretariat: Folke K Larsson, Ida Lindblad Hammar and Mats H Johansson
- Expert group and work reports (RISE, IVL, SLU, Kemakta)
- Final report to the Swedish Government, January 2020*;*

  Sustainable Sludge Management, *SOU 2020:3*
- Referral until May 25, 2020

Remit

- Propose ban of spreading wastewater sludge together with requirement of recovering Phosphorus
- Describe technical developments for P-recovery from wastewater sludge
- If necessary – propose financial support systems
- Secure future upstream-activities
- Analyse socio-economic consequences, alternative scenarios, financing and environmental assessments

Several metods for technical P-recovery in the processes of wastewater treatment plants



Within the plant

Outside the plant

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Technical P-recovery – variables of interest

- Potential for P-recovery
- Type of P-product
- Degree of non-toxicity in products
- TRL
- Management of end-products
- Logistics and need of external facilities outside WWTP

Proposals in bullet form

- Ban on spreading of sewage sludge on or in soil. Two alternatives: (1) total ban or (2) ban with exception for high quality sludge on productive farmland
- P-recovery from sewage sludge: 60 % (plants >20 000 pe)
- Implementation phase 12–15 years
- Remit to Swedish EPA: National checkpoints for sludge quality, coordination of upstream efforts, support for wastewater issues/ecocycle resources and analysis for regulation of other wastewater fractions used in agriculture.

Considerations and dilemmas

- Spreading of wastewater sludge in agriculture – motives for banning? Possibilities within the EU legal framework?
- Regulations also needed for other organic fertilizers
- Several technical P-recovery methods. No method meets all relevant demands
- Uncertain benefits – high costs to households and businesses
- Recovery does not in itself guarantee return to the ecocycle
- Future WWTP: a broader approach to process and ecocycling of nutrients and carbon is needed

Thank you!

Background

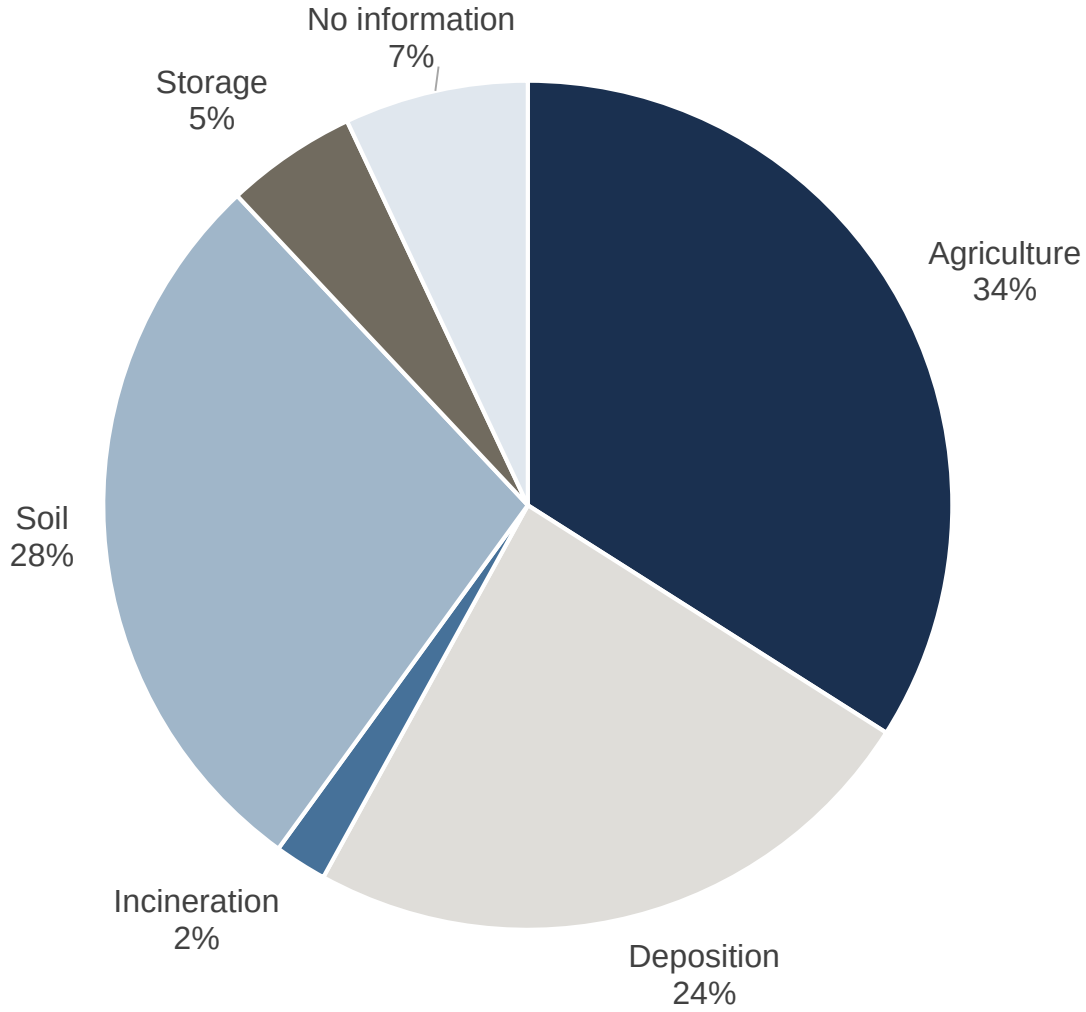
- Present legislation:1994, implementing EU sludge directive
- EPA National investigations – 2002, 2009, 2013
- Revaq – voluntary quality system for sewage sludge use on arable land and upstream measures

Municipal wastewater treatment plants 2016

- 416 plants > 2 000 pe
- 49 plants > 50 000 pe

- Sewage sludge, annual production: 204 000 ton dm

Disposition of sewage sludge in Sweden 2016



204 000 ton dm, SCB (2018), MI 22 SM 1801

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Limit values

	SE – soil mg/kg dm	SE – sludge mg/kg dm	EPA – sludge (proposal 2015)	EU – soil mg/kg dm	EU – sludge mg/kg dm
Hg	0,3	2,5	1	1–1,5	16–25
Cd	0,4	2,0	1	1–3	20–40
Cr	60	100	60	–	–
Cu	40	600	600	50–140	1 000–1 750
Pb	40	100	35	50–300	750–1 200
Ni	30	50	40	30–75	300–400
Zn	100	800	800	150–300	2 500–4 000

Limit values for sludge metal addition

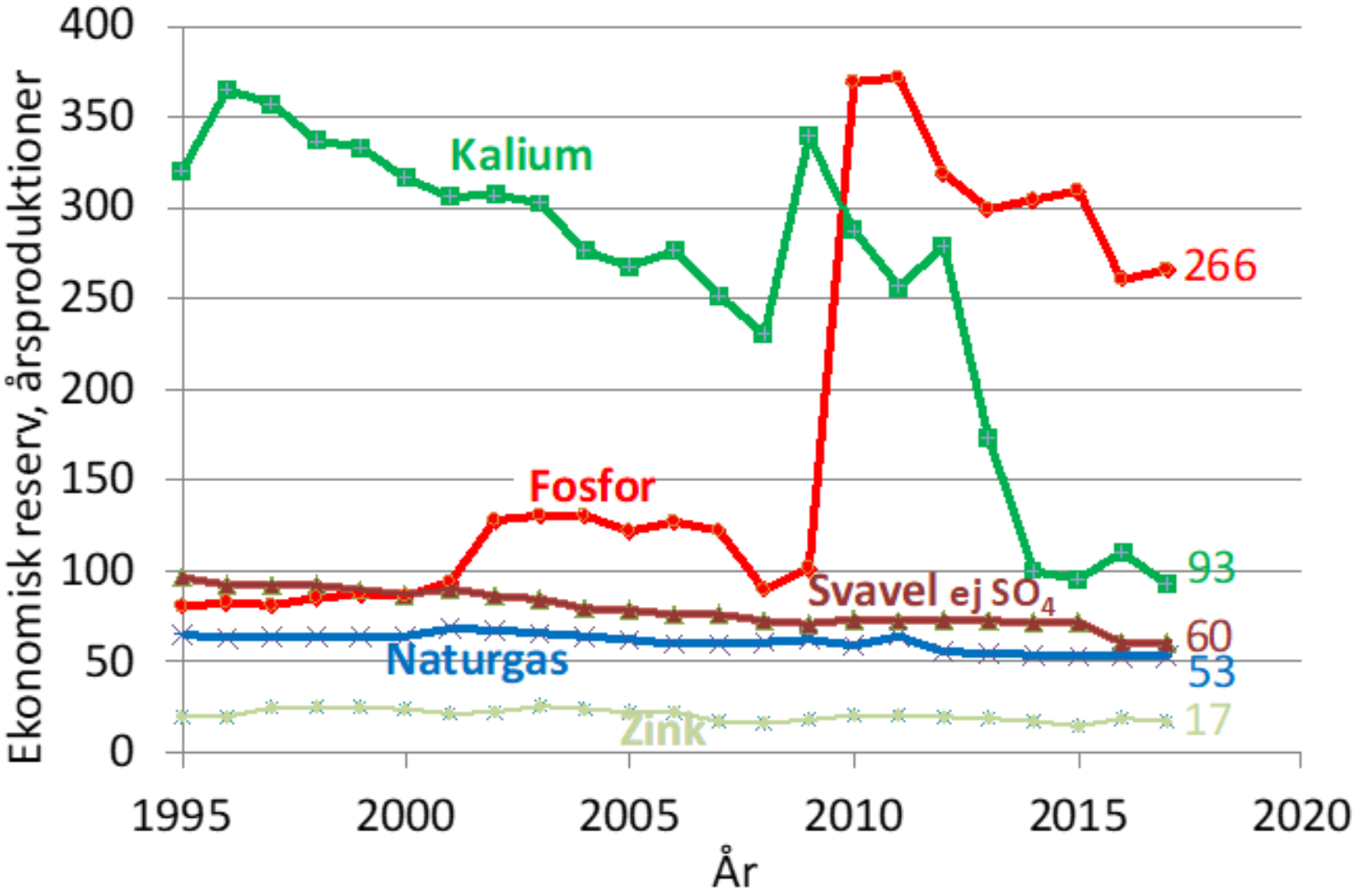
g/ha/year for a defined period

Allowed addition to arable soil	SE – Revaq 2019	SE – Sludge ordinance	EU – Sludge directive
Hg	0,61	1,5	100
Cd	0,53	0,75	150
Cr	40	40	–
Cu	300	300	12 000
Pb	25	25	15 000
Ni	25	25	3 000
Zn	600	600	30 000
As	59	–	–

LCA- and LCC-analysis

- Uncertainty – differing assumptions/results in the analyzes performed
- LCA: focus on emissions från sludge storage
- Effects of cadmium and transports of minor importance
- Sewage treatment – large environmental effects as compared to sludge handling
- Technical extraction of P costly and ecocycle return uncertain – households and businesses stand the costs

Economic reserves (prod.years) for important fertilizer components



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