Small-scale treatment Facilities

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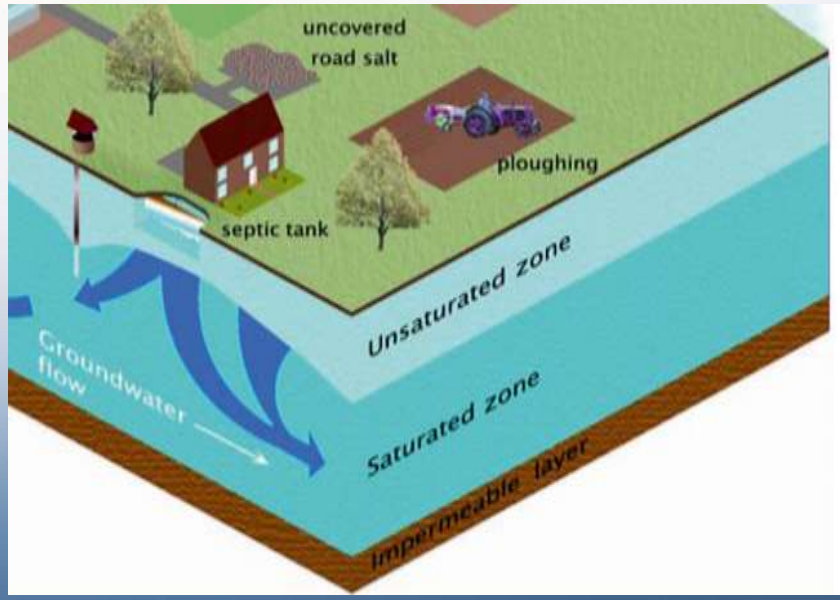
Environmental and health impacts

- Eutrofication
  - Phosphorus
  - Ammonium/nitrite/ nitrate

  ⇒ Causing algae blooms
- Bacteria
  - Impacts on local water supplying system
  - Ground water



Small-scale treatment facilities contribute significantly to P effluents

- 1 million houses in Sweden have on-site sanitation systems
  (55 % being used fulltime)
- 21 % of gross discharge
- 15 % of Swedish population contributes with more P discharge than the population (85 %) connected to central WWTP

Common treatment solutions in Sweden and their efficiencies

- Septic tank 24 %
  - P reduction: 3-20 %
  - N reduction: 3-20%
  - BOD reduction: 10-20 %

- Septic tank + infiltration 40 %
  - P reduction: 25-100 %
  - N reduction: 10 - 80 %
  - BOD reduction 85-97 %

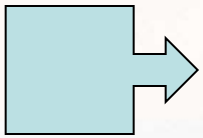
- Septic tank+sand filter 13 %
  - BOD reduction 85-97 %
  - P reduction 25-80 %
  - N reduction10-80 %

Treatment regulations

Swedish Environmental Protection Agancy's treatment requirements

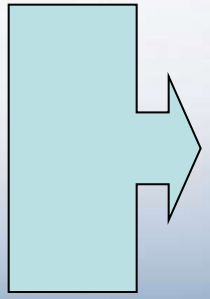
From 2006 (recommendations)

- BOD reduction 90 %
- P reduction 70 %



Normal protection level

- BOD reduction 90 %
- P reduction 90 %
- N reduction 50 %



Sensitive area protection level

Common treatment methods do not fulfill the new requirements

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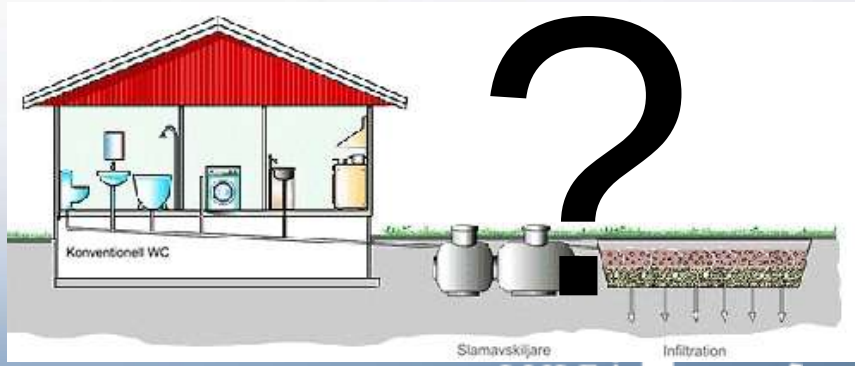

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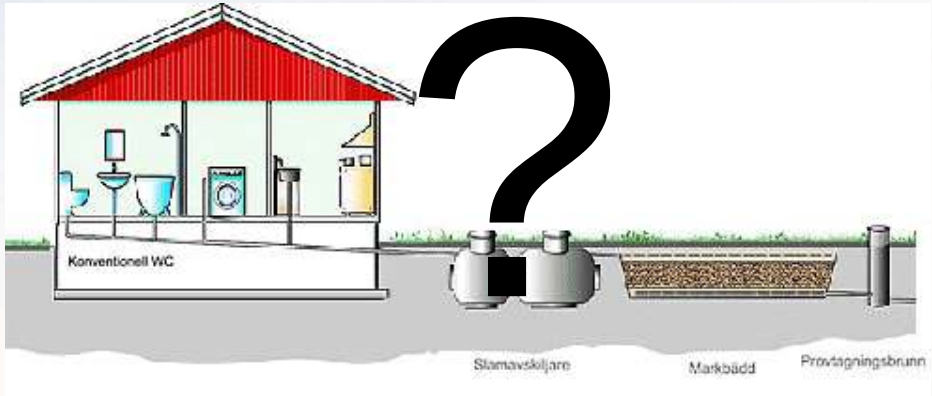

Inventory activities

- Environmental authorities at municipalities are doing inventories
- Focus för inventories are:
- Summer cottage areas ⇒ all around year houses
- Sensitive environments (water bodies)
  - Tool - Information from water authorities' inventories (where water bodies have been classified according to status)

Trends - Small wastewater treatment reactors

- Small wastewater treatment reactors
  - Many manufacturers
  - Biological treatment
    - Aeration
  - Phosphorus treatment
    - Chemical precipitation
  - Operation and maintenance are needed
    - Service or operation agreement

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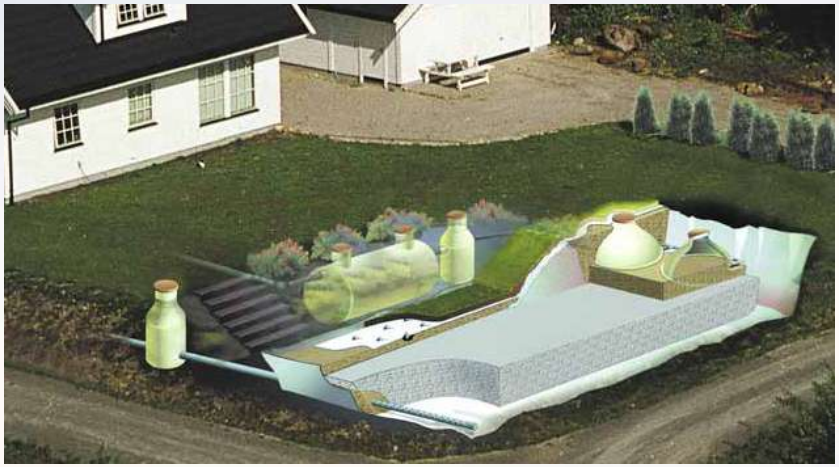
Phosphorus trap – reactive filters

- Ca rich filter materials
- Precipitation of P



- Entire solution
- Additional filter following an old system

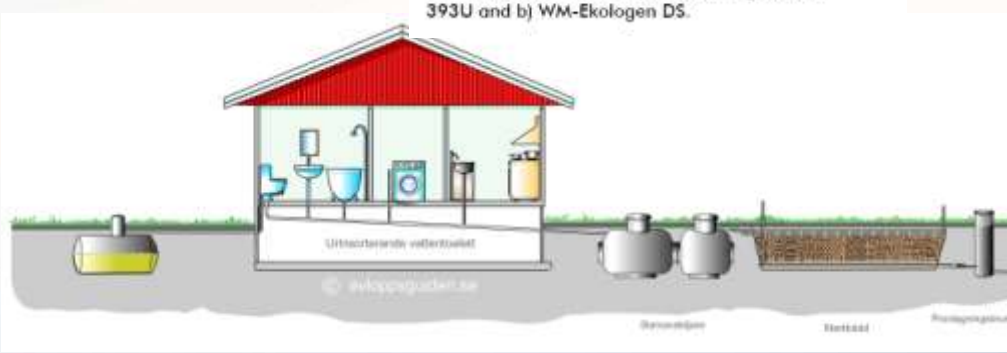
- Filter system (need pretreatment)

- P saturated materials is exchanged after exhaustion and can be used a fertilizer in agriculture

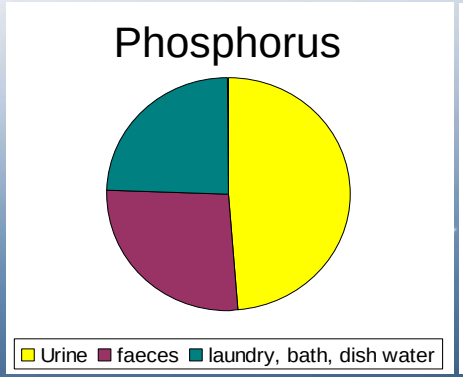
Urine/black water separation

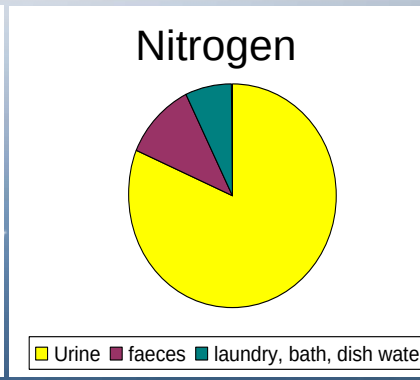
- By collecting urine or toilet waste separately in a tank – high nutrient removal efficiency is achieved
- Phosphorus removal: 75 %
- Nitrogen removal 90 %

Figure 8. Thwo urine-diverting toilet models on the Swedish market. a) Gustavsberg Nordic 393U and b) WM-Ekologen DS.



- Products treated (stored composted or digested)
- Used as fertilizer





Robustness and costs

- When develop treatment facilities, robustness of systems important
  - Operation and maintenance efforts
  - Avoid fragile details which can break down
  - Cold climate aspects (freezing and low biological activity)

  - Costs
  - In some rural areas the cost for new treatment facilities are higher than value of the house…

Research – Improvement of infiltration design

Is it possible to change:

- Design - Length, width and depth
- Feeding Regimes

to improve treatment removal efficiency of sand infiltration?

In what types of conditions (soil types, groundwater level etc) can filtration systems be used to fulfill the requirements?

Another option

- Connect houses with small-scale treatment facilities to sewage network and central wastewater treatment plants
  - A planning process
  - Expensive solutions
  - Only possible for rather densely built settlements
  - Expansion of heavy infrastructure

Summary

- Small-scale treatment facilities contribute significant to P discharge
- New regulations - traditional types of facilities do not fulfill requirements
- Inventories
- Upgrading the treatment facilities
- Which alternatives should be recommended?