Tid for paradigmeskifte i VAbransjen

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Waste hierarchy for wastewater









Off-grid house



Off grid houses exist – still linear

- Eco house Kathmandu
- Sustainable house Sydney
- Rainwater fed systems
- Water treatment and reuse for irrigation or ground water recharge
- Challenge
 - Wastewater management







Internal water recycling

- Blue diversion water wall EAWAG
- Orbital systems
 - 5L water/shower
 - 12L flow/min



Laundry

- Deionised water washing- no detergents
 - Easier to treat water
 - Circular system
- Steaming of clothes
 - LG system
- Xero polymer beads
 - Small amount of water





Dishwashing

- Water used as carrier
- Internal circulation
 - Elektrolux 0,4L per cycle
- Beeds for cleaning
 - Granuldisk small amount of water





Technology available

- Low water consumption facilities
- Replacement of water in systems
- Local treatment of water
 - Circular systems
 - RO-systems for salt water





Flow of nutrients from households



Toilet – urine system requirement

• Family of 4



Alkaline urine dehydration

- Polluted as wastewater
- Dilluted as fertiliser
- P chemically easy
- N challenging
- K impossible



Effect of drying



95 % VOLUME REDUCTION 25 times **NUTRIENT CONCENTRATION** >80% N RECOVERY **100%** P RECOVERY **100%** K recovery





Urine potential to replace N

The new UD system

- Urine diversion
 - Flush no flush
- Placed in toilet room
 - No extra piping
 - $0.25m^2$ for family of 4
- Installation at VA-Syd Malmö

A fully circular system

- Advantages
 - Cost per unit
 - No location limitation
 - No pollution of environment
 - Pathogens
 - Pharmaceuticals
 - Nutrients
 - Concentrated fractions
 - Pollutants
 - Fertiliser
 - Resource recovery

- Disadvantages
 - Expensive
 - Complex system at home
 - Individual risk
 - Pathogens
 - Pharmaceuticals

The future – off the grid sanitation

- 1m3 treatment tank
 - 1 week water/person
 - Recilience
 - No stormwater intrution
 - Always water available
 - Only 1 system failing at time
- Service level
- Challenge mentally dirty water
- Key to go off grid!
 - Internal circulation
 - Same service level as today

Conclusion

- Reason to circular system
 - Reciliance
 - National 30% of chemical fert
 - Individual
 - No pollution
 - Resource recovery

• How?

- Waste heirarchy
- Circular system
- New way of thinking
- Not looking at water as something disposable