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SUSTAINABLE WATERS
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Water Recycling Toolbox

Recycling treated wastewater for agricultural use

Bornholm’s Energy & Utility Co. A/S

Real-world pilot replication blueprint

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Introduction to the pilot measure

Recycling treated wastewater for agricultural use

Bornholm’s Energy & Utility Co. A/S

15 March 2023

Program

Local water management situation

Pilot: Reuse of WWTP effluent for agricultural irrigation

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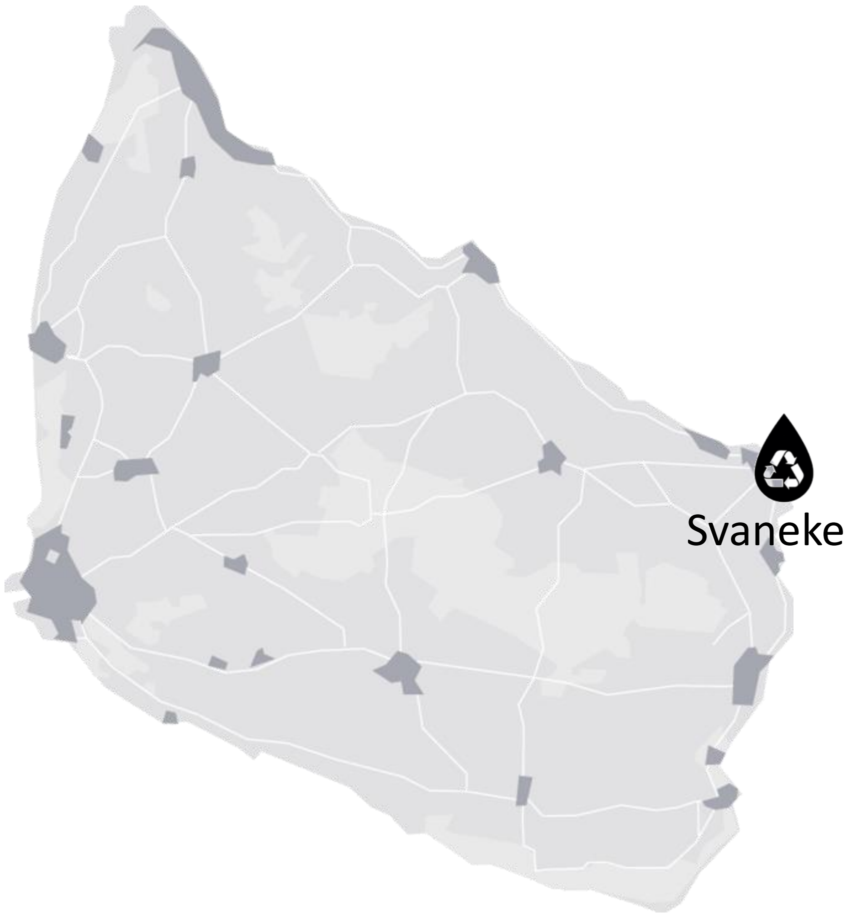
- Heavy rainfall – overflow of sewage system and nutrient outflow to the Baltic sea
- Draughts – impacting the agriculture and groundwater formation
- Tourist season puts a pressure on the wastewater treatment plants and drinking water supply
- Challenges with drinking water quality – organic micropollutants

- Low-tech water filter for purification of WWTP effluent
- Filter consisting of sand, straw (or wood chip) and lime
- Water quality monitored to investigate if the water is suited for agricultural irrigation (Regulation (EU) 2020/741)
- Idea stems from a similar filter built on Bornholm in the 1990ies



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Application for permissions
- Building/ construction
- Coastal protection area
- Ancient history site
- Protected forest
- VVM screening?
- Wastewater treatment plan for the municipality?

Test of the filter material
- Hydraulic conductivity
- Treatment efficiency?

Design of the filter
- Size (area)
- Location in the terrain
- Budget

Literature study
- Denitrification process
- Wood chip vs straw

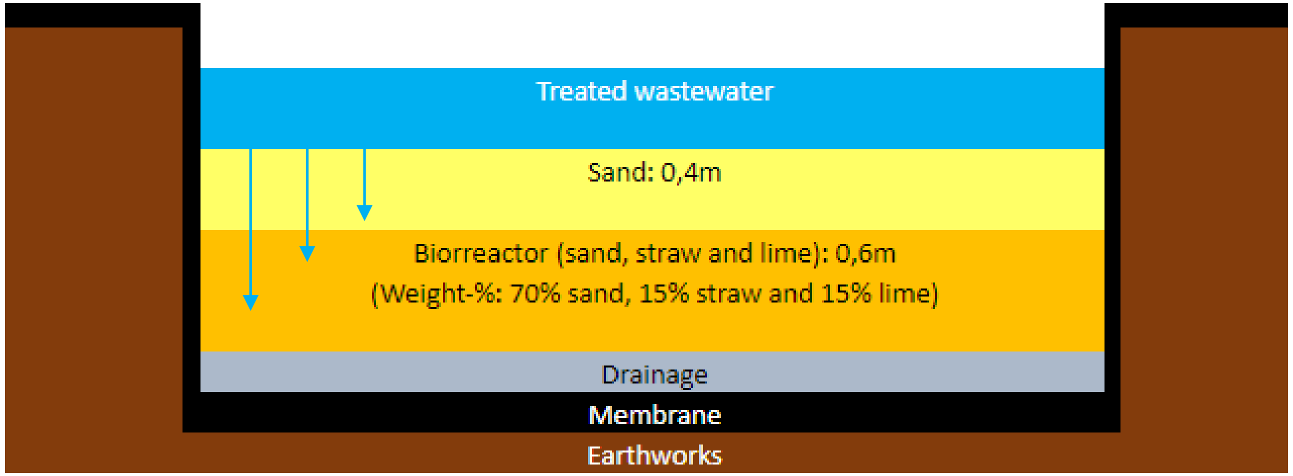
Tender process

Construction phase

Operation and monitoring of quality

- Anaerobic filter – treatment process
  - Denitrification: straw acts as C-source for the process, lime will prevent the water from getting too acid
  - P and organic micropollutants expected to settle with the suspended solids on top of the filter
  - Bacterial degradation expected

- Anaerobic filter – size
  - Preliminary area: 250 m^2
  - Velocity of water:
    5-10 cm/hours (to be determined)
  - Treatment capacity:
    to be determined (hydraulic conductivity)



- Water quality monitoring (tentative list)
  - Nutrients (N and P)
  - Microorganic pollutants
  - Physical-chemical parameters
  - Parameters according to EU Regulation 2020/741, class D, se table below

Reclaimed water quality class	Indicative technology target	Quality requirements				
		E. coli (number/100 ml)	BOD_5 (mg/l)	TSS (mg/l)	Turbidity (NTU)	Other
A	Secondary treatment, filtration, and disinfection	≤ 10	≤ 10	≤ 10	≤ 5	*Legionella* spp.: < 1 000 cfu/l where there is a risk of aerosolisation Intestinal nematodes (helminth eggs): ≤ 1 egg/l for irrigation of pastures or forage
B	Secondary treatment, and disinfection	≤ 100	In accordance with Directive 91/271/EEC (Annex I, Table 1)	In accordance with Directive 91/271/EEC (Annex I, Table 1)	-	
C	Secondary treatment, and disinfection	≤ 1 000			-	
D	Secondary treatment, and disinfection	≤ 10 000			-	

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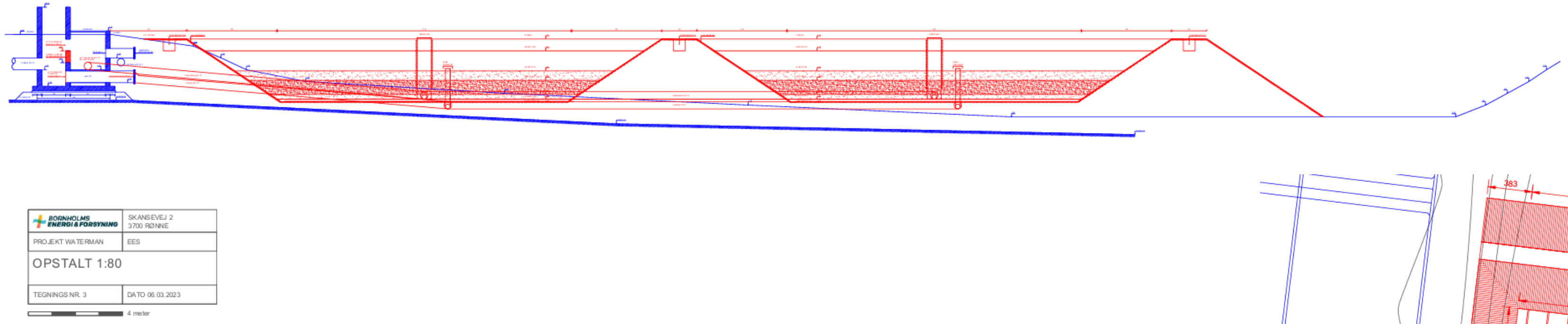
Aarsdalevej

Picture taken in February 2023

Visualization of the filter

REUSE OF WWTP EFFLUENT FOR AGRICULTURAL IRRIGATION



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- Any ideas and inputs are welcome!
  - Does someone have experience with this type of filter/bioreactor? (Denitrification, formation of dinitrogenoxide etc.)
  - Regulation (EU) 2020/741 (Reuse of water for irrigation)

Thanks!

Sara and Daniel can be contacted at sb@beof.dk and dsl@beof.dk

We are looking forward to the collaboration!

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SUSTAINABLE WATERS
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1st Peer-review session

Recycling treated wastewater for agricultural use

Bornholm's Energy & Utility Co. A/S

5 Sept 2023

WaterMan – Pilot status

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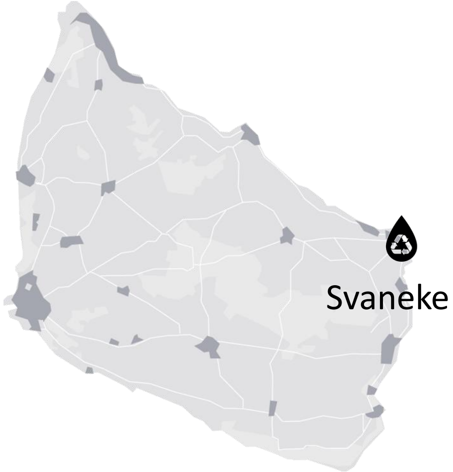
WATERMAN PILOT STATUS

- Agenda
  - Reminder
  - New situation
  - Monitoring of source water
  - Stakeholders
  - Risk assessment & monitoring
  - Work done since the kick-off
    (literature review and experimental work)
  - Future plans

REMINDER – GOALS, LOCAL CONDITIONS AND CIRCUMSTANCES



- Original plan:
  - Full-scale low-tech media filter consisting of sand, straw (or wood chip) and lime for purification of WWTP effluent
    (slow sand filter)
  - Idea based on similar filter built on Bornholm in the 1990ies
  - Intended use for both reuse (irrigation of farmlands) and as a method to reduce nutrients to the Baltic sea at periods when irrigation is not needed

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REMINDER – WATER REUSE SCHEME AND LEGAL REQUIREMENTS

- Local farmer who is interested in using the filtered WWTP-water for irrigation of plants grown for spinach seeds
- Class D water would be required for this use (EU 2020/741), plus potentially requirements regarding e.g. organic pollutants

Table 2 – Reclaimed water quality requirements for agricultural irrigation

Reclaimed water quality class	Indicative technology target	Quality requirements				
		E. coli (number/100 ml)	BOD_5 (mg/l)	TSS (mg/l)	Turbidity (NTU)	Other
A	Secondary treatment, filtration, and disinfection	≤ 10	≤ 10	≤ 10	≤ 5	*Legionella* spp.: < 1 000 cfu/l where there is a risk of aerosolisation Intestinal nematodes (helminth eggs): ≤ 1 egg/l for irrigation of pastures or forage
B	Secondary treatment, and disinfection	≤ 100	In accordance with Directive 91/271/EEC (Annex I, Table 1) 25	In accordance with Directive 91/271/EEC (Annex I, Table 1) 35	-	
C	Secondary treatment, and disinfection	≤ 1 000			-	
D	Secondary treatment, and disinfection	≤ 10 000			-	

EU 2020/741 – EUR-Lex - 32020R0741 - EN - EUR-Lex (europa.eu)
Direcitve 91/27 EEC – EUR-Lex - 01991L0271-20140101 - EN - EUR-Lex (europa.eu)

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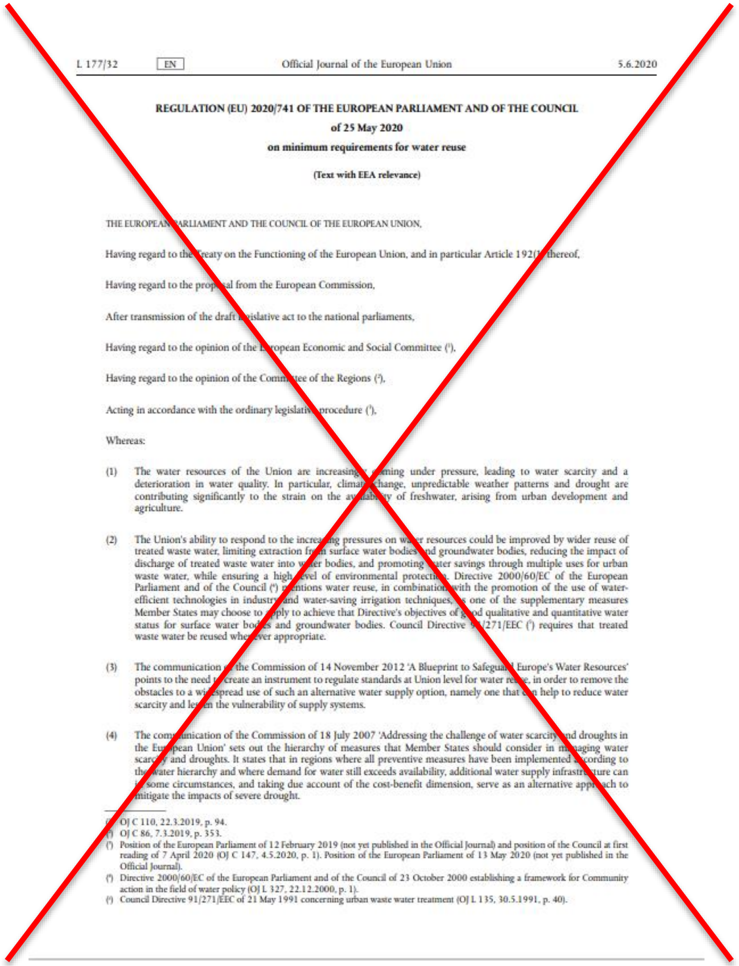
NEW SITUATION – CHANGE OF PLANS



L 177/32 EN Official Journal of the European Union 5.6.2020

REGULATION (EU) 2020/741 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 25 May 2020

on minimum requirements for water reuse

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 192(1) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee [1],

Having regard to the opinion of the Committee of the Regions [2],

Acting in accordance with the ordinary legislative procedure [3],

Whereas:

(1) The water resources of the Union are increasingly coming under pressure, leading to water scarcity and a deterioration in water quality. In particular, climate change, unpredictable weather patterns and drought are contributing significantly to the strain on the availability of freshwater, arising from urban development and agriculture.

(2) The Union's ability to respond to the increasing pressures on water resources could be improved by wider reuse of treated waste water, limiting extraction from surface water bodies and groundwater bodies, reducing the impact of discharge of treated waste water into water bodies, and promoting water savings through multiple uses for urban waste water, while ensuring a high level of environmental protection. Directive 2000/60/EC of the European Parliament and of the Council [4] mentions water reuse, in combination with the promotion of the use of water-efficient technologies in industry and water-saving irrigation techniques, as one of the supplementary measures Member States may choose to apply to achieve that Directive's objectives of good qualitative and quantitative water status for surface water bodies and groundwater bodies. Council Directive 91/271/EEC [5] requires that treated waste water be reused whenever appropriate.

(3) The communication of the Commission of 14 November 2012 'A Blueprint to Safeguard Europe's Water Resources' points to the need to create an instrument to regulate standards at Union level for water reuse, in order to remove the obstacles to a widespread use of such an alternative water supply option, namely one that can help to reduce water scarcity and lessen the vulnerability of supply systems.

(4) The communication of the Commission of 18 July 2007 'Addressing the challenge of water scarcity and droughts in the European Union' sets out the hierarchy of measures that Member States should consider in managing water scarcity and droughts. It states that in regions where all preventive measures have been implemented according to the water hierarchy and where demand for water still exceeds availability, additional water supply infrastructure can in some circumstances, and taking due account of the cost-benefit dimension, serve as an alternative approach to mitigate the impacts of severe drought.

[1] OJ C 110, 22.3.2019, p. 94.
[2] OJ C 86, 7.3.2019, p. 353.
[3] Position of the European Parliament of 12 February 2019 (not yet published in the Official Journal) and position of the Council at first reading of 7 April 2020 (OJ C 147, 4.5.2020, p. 1). Position of the European Parliament of 13 May 2020 (not yet published in the Official Journal).
[4] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1).
[5] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment (OJ L 135, 30.5.1991, p. 40).

- EU 2020/741 will not be used in DK

↓

We will conduct a feasibility study:

- Testing the filter in small scale
- Assessment of water quality and quantity, operation of the filter, the economy and the business case
- Results used for dialog with the Environmental Ministry about the future of the regulation in DK

Furthermore we will only focus on the reuse case, omitting the nutrient reduction (straw and lime), as this was a legacy from the seed project which was to a start focusing on nutrient reduction, and as the filter is now down-scaled.

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STAKEHOLDERS

- Environmental Ministry
- Local farmer
- The local farmers association (Bornholms Landbrug of Fødevarer)
- BEOF’s department of wastewater operation
  - operational requirements – as little contact with wastewater and manual work as possible when/if filter needs to be cleaned

RISK ASSESSMENT & MANAGEMENT

- On our To-Do-list!
  We have had a brief discussion on the topic, started identifying hazards, risks, exposure scenarios, risk measures and tools/methods
- Will be done by the project team

MONITORING OF SOURCE WATER

- Regular monitoring of WWTP-effluent, flow proportional 24h

eurofins

DANAK
TEST Reg.No. 168

Eurofins Miljø A/S
Ladelundvej 85
6600 Vejen
Danmark
Telefon: 7022 4266
CVR/VAT: DK-2884 8196

Bornholms Spildevand A/S
Skansevej 2
3700 Rønne
Att.: Torben Jørgensen

Rapportnr.:	AR-23-CA-23067834-01
Batchnr.:	EUDKVE-23067834
Kundenr.:	CA0017497
Modt. dato:	10.08.2023

Analyserapport

Prøvested:	Svaneke Renseanlæg - u020217 / 14050003
Prøvetype:	Spildevand
Prøveudtagning:	12.07.2023 til 13.07.2023
Prøvetager:	Rekvirenten PMS
Analyseperiode:	10.08.2023 - 22.08.2023
Kunde Ref.:	Svaneke rens ud
Prøvemærke:	Udløb 004006960003637751

Lab prøvenr:	**835-2020-80893466**	**Enhed**	**Kravværdier Min.**	**Max.**	**DL.**	**Metode**	**Urel (%)**
Konduktivitet (Ledningsevne)	1000	µS/cm			5	DS/EN 27888:2003	15
Uorganiske forbindelser							
Total Nitrogen	6.5	mg/l			0.05	DS EN ISO 11905-1:1998,ISO 15923-1:2013 mod.	15
Total Phosphor	1.6	mg/l			0.01	DS/EN ISO 6878:2004 part 7 + ISO 15923-1:2013	15
Organiske samleparametre							
BI5 (med ATU)	2.4	mg/l			0.5	DS/EN 1899-1	20
COD, kemisk iltforbrug	32	mg/l			5	ISO 15705	15
Oplysninger fra rekvirent							
Prøvetagningsmetode	Mgd.prop.				*		
Prøvetagningsudstyr	Eget				*		
Vandmængde	1737	m³/døgn			*		
Vandtemp. i dunk v. nedtagning	3.8	°C			*		
Nedbør	10	mm			*		
Nedbør, døgnet før prøvetagning	10	mm			*		

Batchkommentar:

Analyser er udført på prøve der er modtaget frosne.

- One E. Coli/ Total coliform measurement of WWTP-effluent, grab sample in May
  - E. Coli: approx. 27.000 CFU/100 ml
  - Total Coliform: approx. 271.700 CFU/100 ml

SLOW SAND FILTER (SSF) LITERATURE REVIEW – WASTEWATER APPLICATIONS

- SSF widely used for drinking water applications – first installation in London in 1829
- Sand filters are also applied for **wastewater applications**, but primarily rapid sand filters (RSF) are used.
- Experience with SSF and wastewater are mainly from pilot scale tests
- Pilot studies on wastewater show efficient removal of TSS and E. coli:

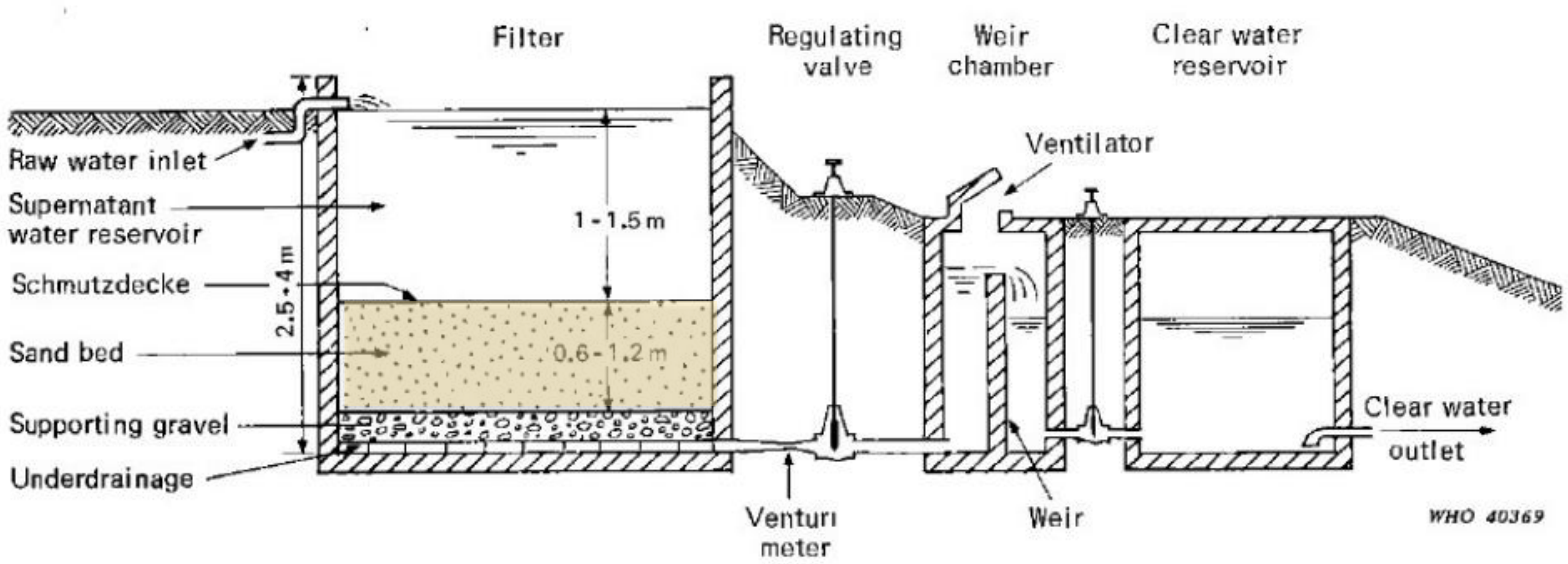
  Effluent: TSS 1.2–2.3 mg/l and <100 E. coli / 100 ml
- Simple configuration with very low energy usage
- No pumping if landscape allows for it.
- Modular solution
- No back washing

Attention to:

- Highly complex biological processes (Schmutzdecke)
- Requires scraping of surface at regular intervals (to remove Schmutzdecke)
- Requires a lot of land (surface area) to achieve high outputs due to low flow rates
- Storage
- Disinfection downstream (if required)

OUR TECHNOLOGY: SLOW SAND FILTER AS TERTIARY TREATMENT OF WASTEWATER

Slow sand filter (SSF)



- This is a schematic from the 1974 World Health Organization (WHO) “Slow Sand Filtration” design manual (Huisman & Wood, 1974. pg 18).

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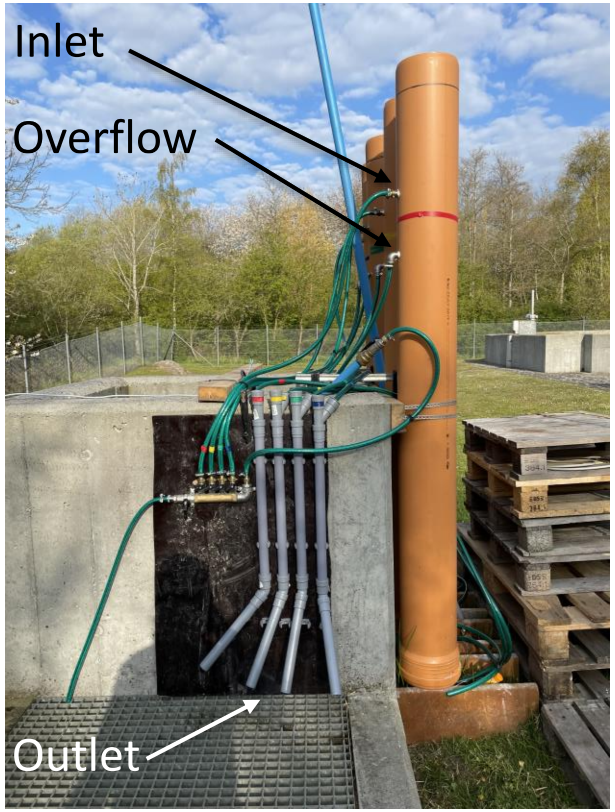
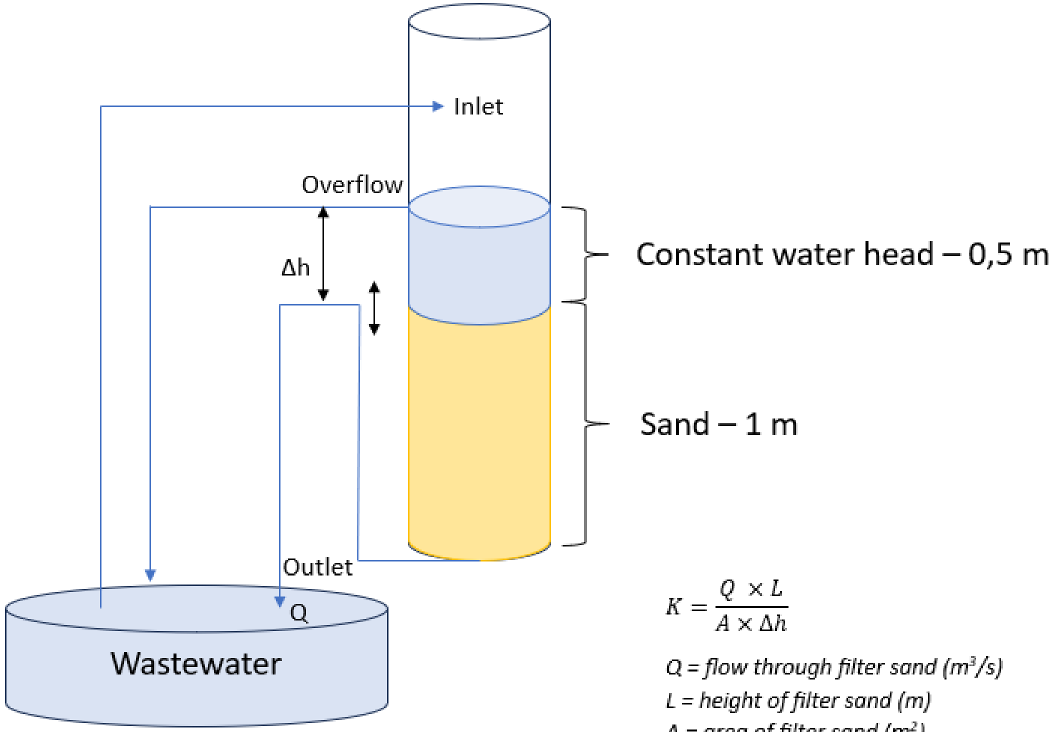
- Testing the hydraulic capacity of different sands





$$K = \frac{Q \times L}{A \times \Delta h}$$

Q = flow through filter sand (m^3/s)
L = height of filter sand (m)
A = area of filter sand (m^2)
Δh = distance between height of outlet and overflow (m)

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WORK DONE SINCE THE KICK-OFF

- Hydraulic capacity of sand

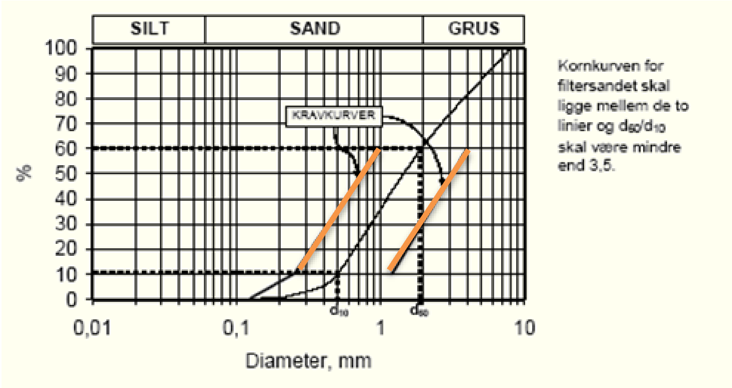
”Concrete sand”

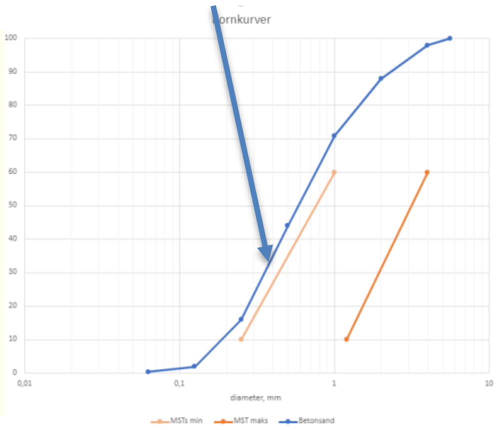
0/8 mm sand

Mixes of sand, straw and lime

- Sand for test columns selected on basis of the Danish Environmental Protection Agency’s recommended grain size distribution profile for biological sand filters.

Blue line = Concrete sand





- Sand from local gravel mine on Bornholm. Sand is processed (separated by particle size and washed)

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WORK DONE SINCE THE KICK-OFF

- Results hydraulic capacity

”Concrete sand”
K = 0,00035 m/s

0/8 mm sand
K = 0,00012 m/s

Mixes of sand, straw and lime

- Test indicate no change in K values over time = no clogging of the sand filter

- We will later deicide what type of sand to use for the feasibility study

- Aiming for a traditional SSF– filter flow 5-10 cm/hours
  Preliminary data calculated:
  = equal to permeate flow of 1,2-2,4 m3/m2/day
  = After Schmutzdecke built up: **0,2 m3/m2/day**

- => 5 m2 filter area to produce 1m3 water/day (with Schmutzdecke)

WORK DONE SINCE THE KICK-OFF

- Observations hydraulic capacity – the Schmutzdecke

- Reduces the flow significantly
- Needs to be removed from time to time, due to it acting as plug reducing the flow
- Schmutzdecke is removed by scraping top layer of sand after draining the filter

WORK DONE SINCE THE KICK-OFF

- The microbial biodegradation is taking place mostly in the Schmutzdecke
- We need the Schmutzdecke!
- Compromise between water quality and quantity

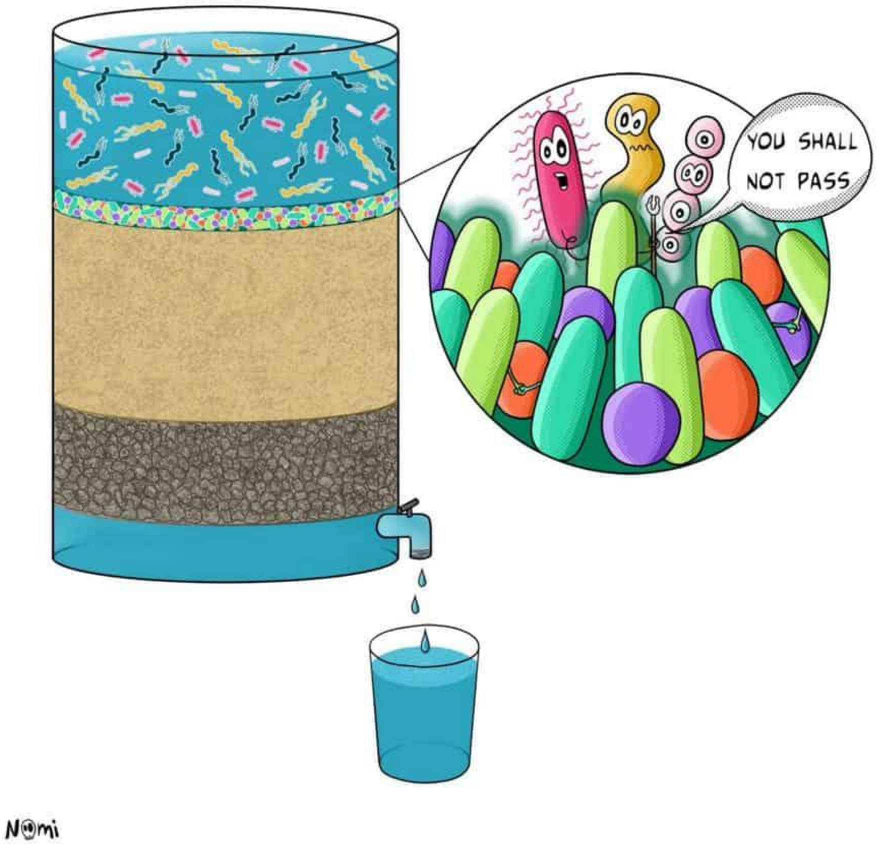
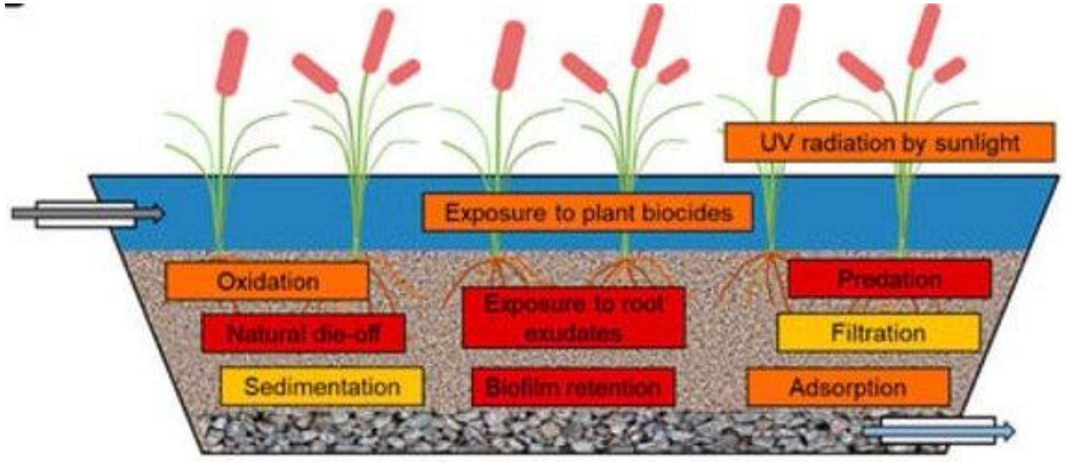


image source: https://sarahs-world.blog/microbes-clean-our-drinking-water/

WORK DONE SINCE THE KICK-OFF

- Literature study – SSF and Schmutzdecke



- Schmutzdecke is complex!
- Is composed of algae, bacteria and protozoans
- Temperature critical for good activity; minimum 10-15 °C
- Oxygen, water quality etc.
- We can't control these processes…

[Water | Free Full-Text | Removal of Pathogens in Onsite Wastewater Treatment Systems: A Review of Design Considerations and Influencing Factors (mdpi.com)]

Add disinfection to stabilize the water quality?

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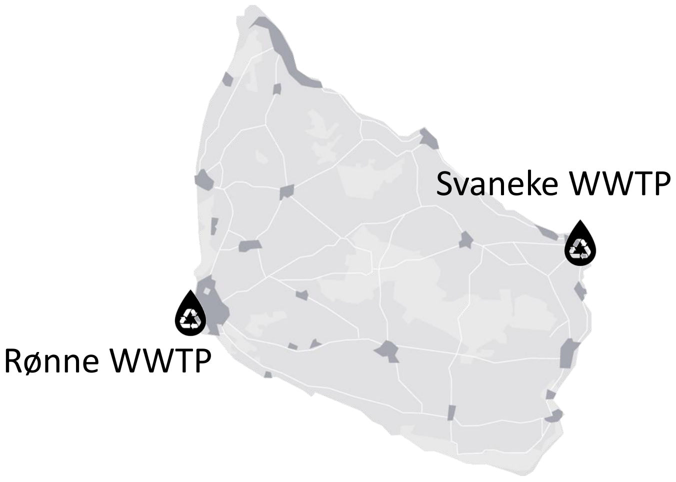
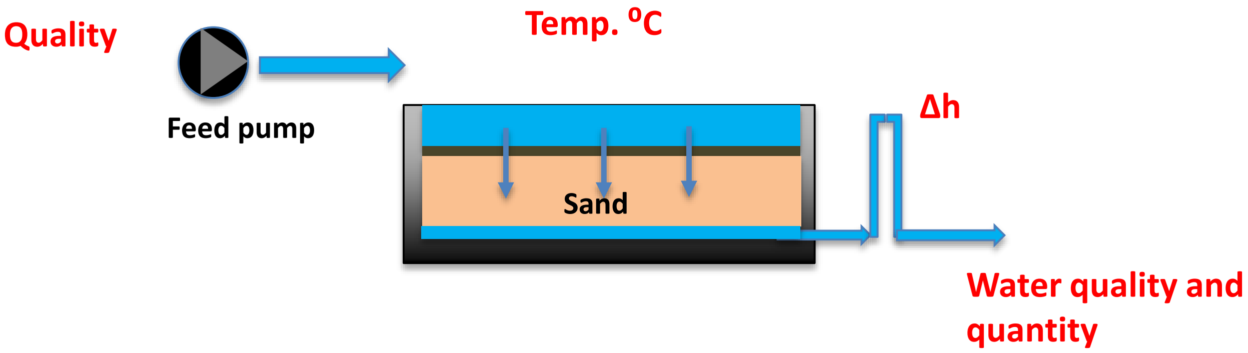
Feasibility study– preliminary design

Design and materials for experimental setup

- Feed pump: Submersible pump
- Tank: Plastic, size 5-10m2
- Sand layer: 100cm
- Drain layer: 20cm (crushed granite)
- Drain pipes: Plastic, perforated





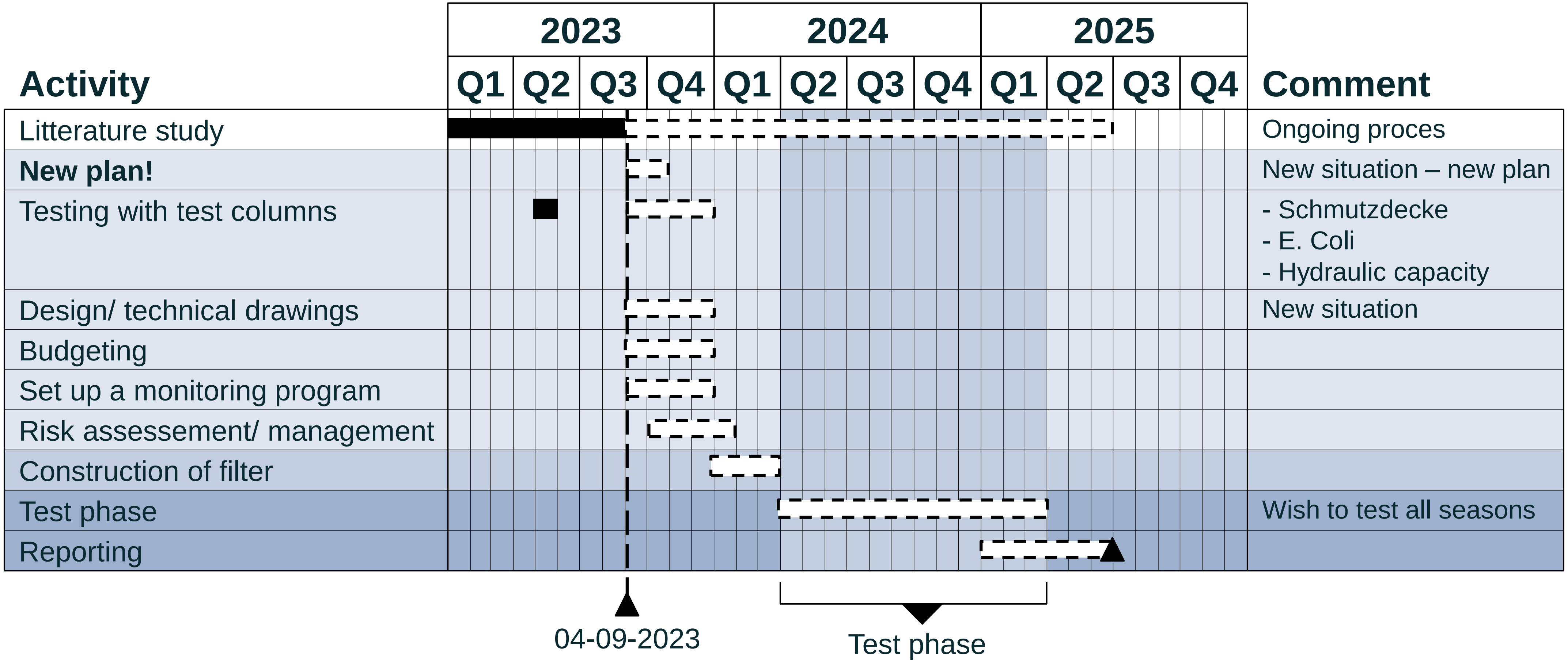
Location of sand filter

- Svaneke WWTP: Original location, but WWTP consists only of biological treatment, and no clarification tank.
- Rønne WWTP: Alternative location, Rønne WWTP has a traditional setup consisting of biological treatment + clarification step.

PLANS

- To-do – Phase 1
  - Continue tests with the test columns ("Schmutzdecke", E. Coli, hydraulic capacity)
  - New plans
  - New design/ technical drawings
  - New budget
  - Monitoring plan
  - Risk assessment & management
- To-do – Phase 2
  - Construction of the filter
- To-do – Phase 3
  - Test phase (water quality and quantity, filter operation)
  - Reporting the results

PRELIMINARY PLANS



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Selected literature

Slow sand filtration of secondary effluent for wastewater reuse: Evaluation of performance and modeling of bacteria removal
Kilian M. W. Langenbach
INTRODUCTION (tum.de)

SSF Training material from Oregon Drinking Water Services.
Oregon Health Authority : Slow Sand Filtration : Surface Water Treatment : State of Oregon

Schmutzdecke- A Filtration Layer of Slow Sand Filter
Schmutzdecke- A Filtration Layer of Slow Sand Filter (ijcmas.com)

1st Peer & expert review session: Recommendations & conclusions

- Keep in mind the feedback of your ministry to your pilot measures: It claims that water reuse is no "business case" in Denmark, and that the application of EU Regulation 2020/741 has therefore limited added value in DK. In order to enable water reuse according to the EU Regulation 2020/741 in Denmark (or at least an exception for Bornholm, like it is in place for Samsø), you will have to demonstrate to the ministry that there is a "business case" in water reuse. It is therefore not sufficient to create a low-tech filter & treatment process of high quality. What has to be proven by your pilot measure is that water reuse from WWTP for agricultural irrigation can be cost efficient and a business case for the farmers. Economic calculations & aspects are, therefore, essential parts of your pilot measure and its evaluation.
- Considering this strategic focus of your pilot action (> proving the need, feasibility & cost efficiency of water reuse for agricultural irrigation on Bornholm / in DK), it could be considered to involve further parties & stakeholders into the activities. For example, the Farmers' Association may become a partner in the lobbing towards the ministry, and back-up the view of the single farmer taking part in the pilot, who wants to be a pioneer and to show that there is a business case (economic potential).
- Technical design of the low-tech filter:
  - Isolate the slow sand filter to optimize the temperature for microbial degradation. You can dig your filter in the ground (half on ground / half underground). Then you would have a construction that has better prospect to keep the temperature.
  - You could use some insulation material and / or soil to keep the filter warmer. A temperature of more than 5°C is still safe for the Schmutzdecke (biofilm). It still works then, though not as effectively as in case the temperature is higher.
  - With your planned concept, there may occur the necessity to remove the Schmutzdecke (biofilm) manually. This may be avoided by installing 2 sand filters that operate interchangeably (one working, other resting). to keep the balance between build up of the Schmutzdecke during operation and degradation of the Schmutzdecke when the filter is not in use. Alternatively, you may also operate the sand filter intermittently – and use the dry periods for removing / degradation of the Schmutzdecke. Some literature says that an intermittent operation is better than continuous. Have also a look into the concept of French-constructed wetlands (but keep in mind that it is a different process / no sand filter).
- Some parts of the process will be out of your control as biological processes are complex. After the planned year of testing & sampling of the water, you may gain more knowledge and insights if you need a disinfection step to stabilise the water quality.

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Absorption report

Recycling treated wastewater for agricultural use

Bornholm’s Energy & Utility Co. A/S

07 November 2023

WaterMan – Pilot status

E. Coli results
Absorption report

PRELIMINARY REULTS – E. COLI

Concrete sand to be used for the feasibility study

”Concrete sand”

0/8 mm sand

Mixes of sand, straw and lime

E.Coli

	Feed (CFU/100ml)	Concrete sand (CFU/100ml)	0/8mm sand (CFU/100ml)
23-10-2023	142900	100	*No flow*
24-10-2023	19500	5400	500

Schmutzdecke stirred the day before and Δh adjusted

Coliforme

	Feed (CFU/100ml)	Concrete sand (CFU/100ml)	0/8mm sand (CFU/100ml)
23-10-2023	1000000	4000	*No flow*
24-10-2023	1000000	289600	26900

Need to work further on sampling and analysis procedures to get good quality results

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PEER & EXPERT REVIEW

- Business case: Economic calculations will be part of the feasibility study

- Involvement of stakeholder Farmers Association – to have a stronger voice towards the authorities.

- Construction for better insulation:

-Half in ground, cover piping with soil.

-Polypropylene or fiberglass tank for better insulation

- Only one sand filter - Intermittent operation. Two in parallel will not be a solution for upscaling.

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SUSTAINABLE WATERS
WaterMan

2nd Peer-review session

Recycling treated wastewater for agricultural use

Bornholm’s Energy & Utility Co. A/S

7 November 2024

WaterMan – Pilot status

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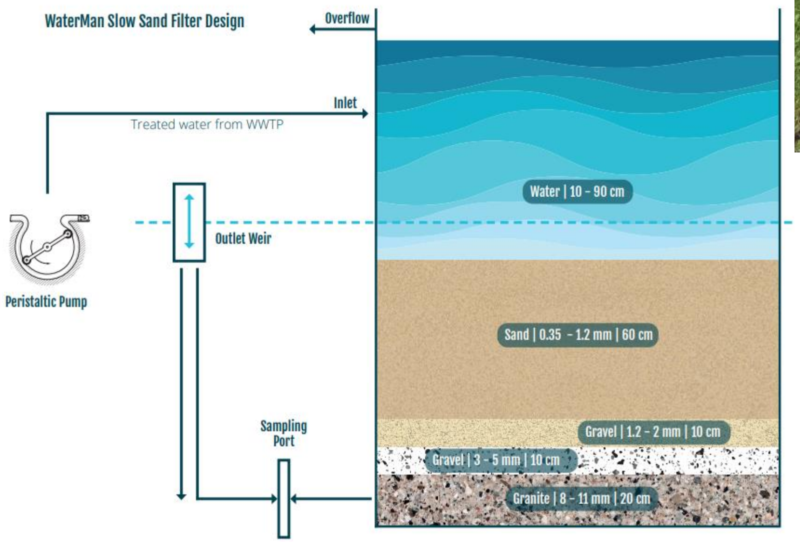
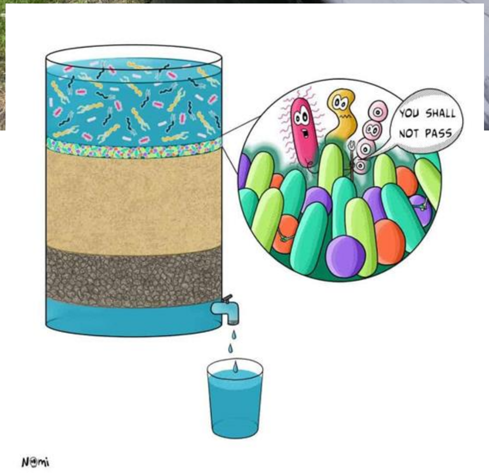
WATERMAN BORNHOLM PILOT

- Agenda
  - Status
  - User groups of the recycled water
  - Stakeholders engagement
  - Evaluation methodology

PILOT STATUS - SSF





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SSF STATUS – operation & results

- Results:

			A	B	C	D	Feed		Filtrate	
Date	Pump C value	Effluent flow (l/h)	Sand-Top (cm)	Water level-Top(cm)	Weir chamber - Top (cm)	**dH Driving pressure**	E.Coli CFU/100 ml	Total Coliforms CFU/100 ml	E.Coli CFU/100 ml	Total Coliforms CFU/100 ml
21-10-2024	300	260	95	33	47	14				
22-10-2024	345	285	95	11	47	36				
24-10-2024	345	120	95	11	47	36				
25-10-2024	345	271	95	26	**82**	56				
28-10-2024	345	225	95	11	**82**	71	17000	795400	370	10000
30-10-2024	345	171	95	11	**82**	71	34000	1000000	972	10000
31-10-2024	345	225	95	17	**82**	65				

- Operation:
  - Unstable flow (changed piping system)
  - Filter overflow
    - Cleaning the sand (harrowing)
  - Fast decline of the outflow
  - Potential decrease of biological activity during winter

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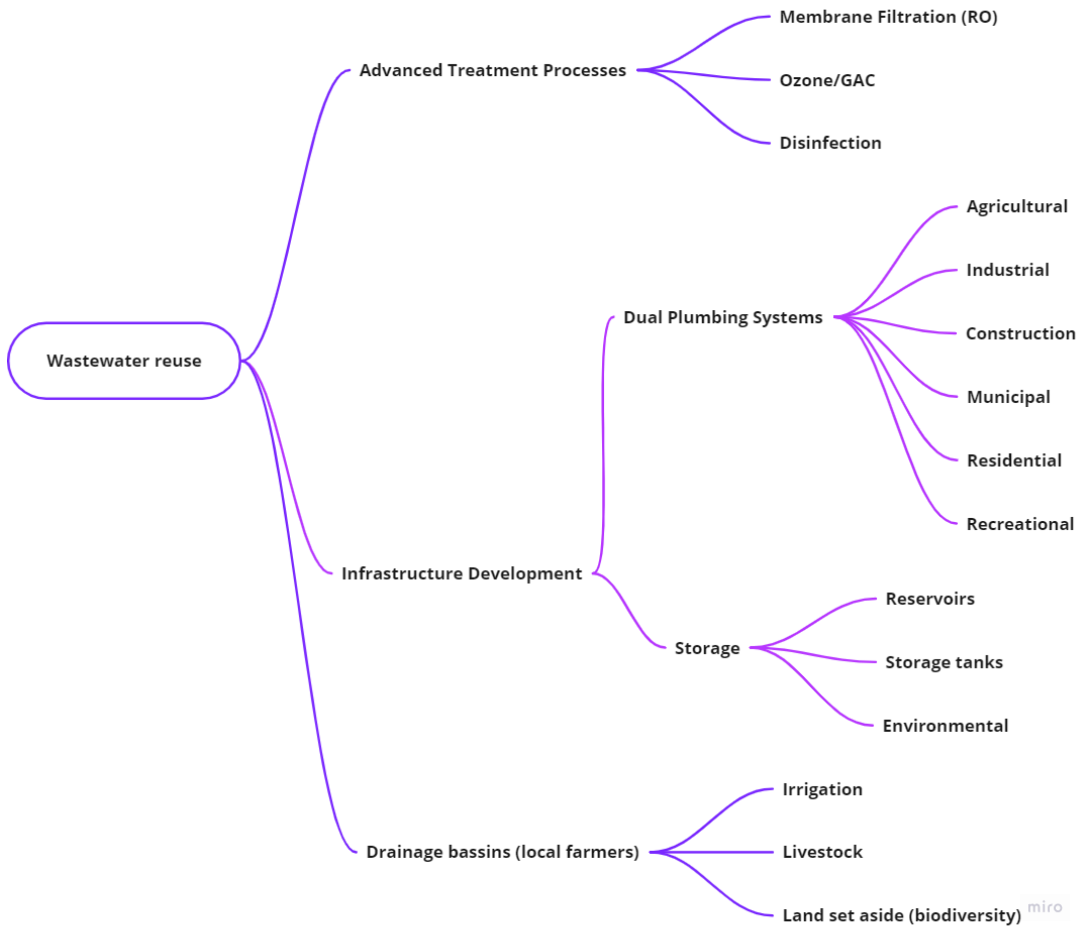
USER GROUPS FOR TECHNICAL WATER

- Envisaged:
  - Local farmers
    - Nearby (pumping; gravity)
    - Distant (pumping; dual plumbing systems)

- Potential:
  - Industry (process water)
    - Cleaning, manufacturing, aquaculture…
  - Municipal (irrigation)
  - Residential (irrigation; toilet flushing)
  - Recreational (golf courses; wetlands (nature parks))
  - Storage (reservoirs; tanks; wetland restoration)



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STAKEHOLDER ENGAGEMENT

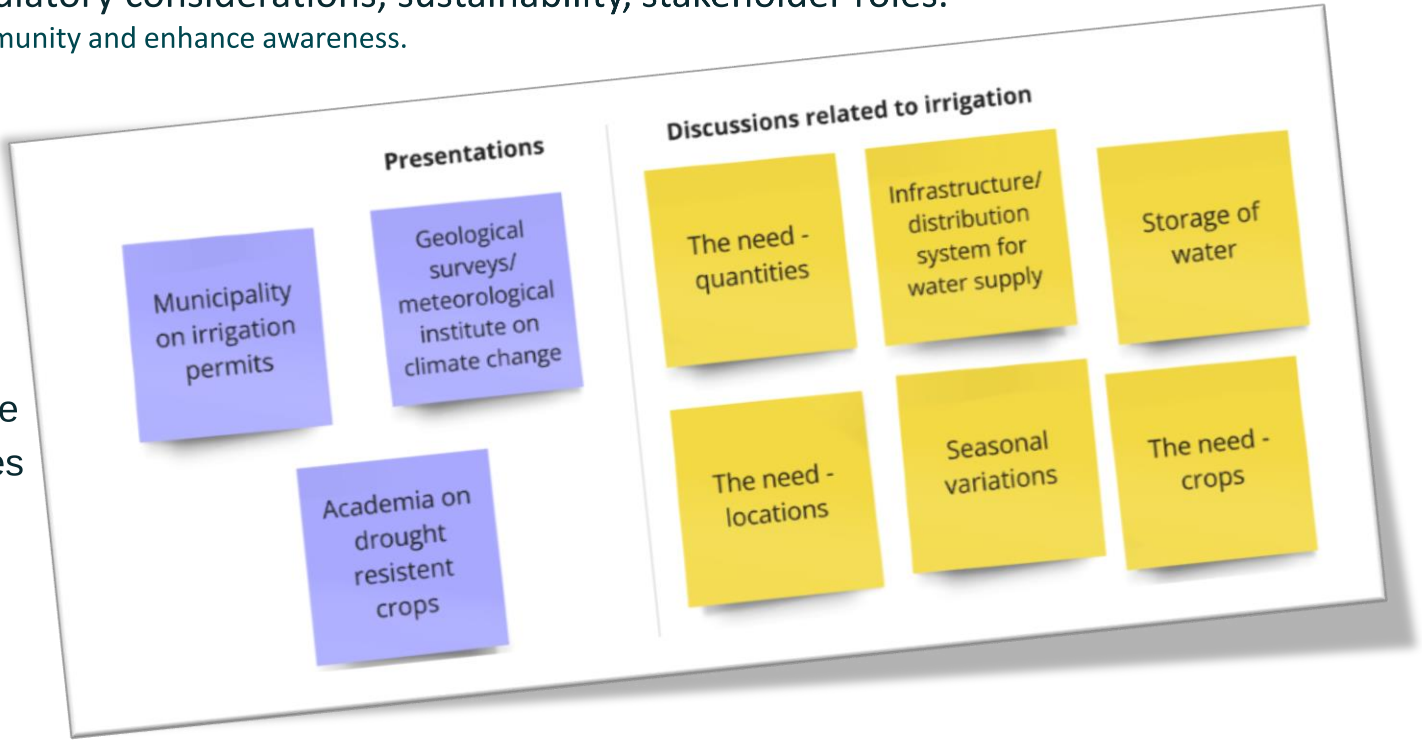
Strategy & motivation

Workshop jointly with SYMSITES Q1 2025

- **Objective**: To educate, explore challenges, brainstorm solutions, and promote acceptance of wastewater reuse.
- **Focus:** Treated wastewater for Agriculture
- **Themes**: Technology, innovation, implementation, regulatory considerations, sustainability, stakeholder roles.
  - **Public Perception & Acceptance**: Strategies to engage the community and enhance awareness.

Potential agenda:

- Introduction and Objectives
- Keynote or Expert Presentation
- Session 1: Technical Aspects of Wastewater Reuse
- Session 2: Regulatory and Policy Frameworks
- Session 3: Stakeholder Engagement & Public Acceptance
- Session 4: Case Study Breakouts – small groups activities
- Session 5: Implementation Challenges & Solutions
- Wrap-up and Takeaways



WATER USAGE – EVALUATION METHODS

Multi-step evaluation aproach

1 - Water Quality Monitoring

- Physical Parameters
- Chemical Analysis
- Microbial Testing

2 - Agronomic Impact Studies

- Soil Testing
- Crop Health and Yield Assessment

3 - Irrigation Efficiency Evaluation (future)

- Drip and Surface Irrigation Performance
- Application Consistency Tests (nutrient deficiency areas)

4 - Long-Term Environmental Monitoring (future)

- Groundwater Testing
- Runoff Analysis

5 - Economic and Social Impact Assessment (future)

- Economic viability (potential yield improvements or savings from water reuse)
- Conduct surveys or interviews with end-users (farmers) to gauge satisfaction, adoption rates, and any challenges faced in using the treated water

Scenarios: greenhouse with growbeds, or farmland (open for discussion with lead partner)

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Thank you

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2nd Peer & expert review session: Recommendations & conclusions

- Investment, but no real-world testing in the case of Bornholm. The proposed considered extension of water use to greenhouse vegetation is a step into very good direction.
- Results of the planned workshop talk with future potential users should feed into local model strategy.

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SUSTAINABLE WATERS
WaterMan

Status updates

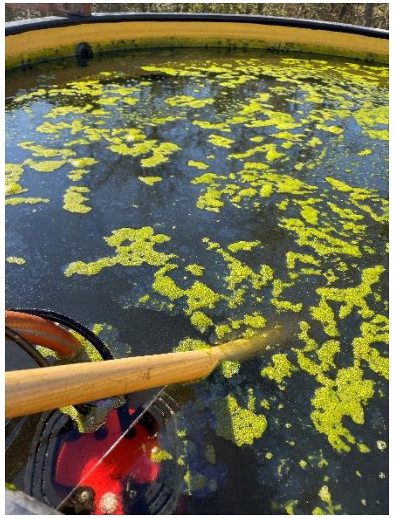
Recycling treated wastewater for agricultural use

Bornholm’s Energy & Utility Co. A/S

30 April 2025

Pilot unit - Slow Sand Filter

- **Operations**
  - Reduction in coliforms and nutrients.
  - High maintenance due to clogging. Reduced water flow.
  - Algae formation, but recently stabilized, perhaps because of a biocide. Water became clear. But still with reduced flow.
- **Sampling/monitoring program (1X week)**
  - Sampling coliforms
  - Monitoring water level and flow
  - Monitoring water temperature
  - *Further analysis to be made*:
    - Medicine & PFAS
    - TSS (inlet and effluent)
- **Cleaning program**
  - For a period (1x week) we “scratched” the top layer with a rake and pumped water out, due to clogging. After cleaning, coliforms level increases, so as water flow, but back to normal in 2 days.
  - At the moment (12/05/25), we are stressing the system (no cleaning) and conduct tests.
  - After further analysis, we intend to replace the sand top layer.






Greenhouse

Plant (spinach) irrigation with water (polished) derived from the WaterMan slow sand filter, and water (nutrient loaded) from the Symsites project. Two separate feeding lines with drip irrigation into capillary boxes, to avoid spilling.

Key Points

- **Positive Impacts of Interaction:**
  - Enhances **awareness** and **acceptance** of innovative practices among potential users.
  - Provides valuable **exposure to the WaterMan project** among farmers.
- **Joint Efforts with Symsites Project:**
  - The initiative was established as a **collaborative task** alongside the ongoing Symsites project.

Workshop with potential users

Key Points

- Information on possibilities and need for reuse of treated wastewater
- Promote stakeholder & consumer acceptance for water reuse

Workshop

- Agriculture irrigation
- Water storage/retention
- Stakeholder engagement
- Potential users
- Discussion on concerns & requirements
- Future water demand; new crops
- Supply options

Local strategy

- Supplement to BEOFs internal strategy ”The future wastewater system” and “Wastewater as a resource”.

Baltic Sea Region Toolbox

- Results presentation

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Access the „BSR Water Recycling Toolbox” here.
https://www.eurobalt.org/waterrecyclingtoolbox/

SUSTAINABLE WATERS
WaterMan

The „BSR Water Recycling Toolbox” was elaborated as part of the project “WaterMan - Promoting water reuse in the Baltic Sea Region through capacity building at local level”, The project is co-financed by the European Union (European Regional Development Fund) and implemented within the Interreg Baltic Sea Region Programme. More information:

eurobalt.org/WaterRecyclingToolbox
interreg-baltic.eu/project/waterman

WaterMan promotes a region-specific approach to water recycling, which intends to use the alternation of too much and too little water that has become typical in the Baltic Sea Region to make the local water supply more resilient, and supports municipalities & water companies in adapting their strategies.