

# Simple Filter, Major Shift in Perspective

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**A pilot project on Bornholm demonstrates how forward-looking water recycling for agricultural use can succeed with well-established technologies. Even more importantly, it has sparked significant momentum in Denmark’s national policy debate.**

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High-tech solutions are not always necessary to build future-ready projects and structures for water recycling. This core idea of the WaterMan project was demonstrated in an exemplary way on the Danish Baltic Sea island of Bornholm.



*Paulo Martins Silva*

Here, a team led by Paulo Martins Silva, project manager at the local utility Bornholms Energi & Forsyning (BEOF), revived a technique many had forgotten: the slow sand filter (SSF). The principle is straightforward. Wastewater that has already undergone treatment at a

wastewater plant percolates slowly through layers of gravel and sand. The cleaning effect is strong enough that the output of the filter can be safely used to irrigate edible crops in agriculture. One visible sign of how effectively the filter works is the so called Schmutzdecke – the biofilm that forms at the top of the sand layer. And, incidentally, at WaterMan partner meetings this term repeatedly caused amusement – especially when Danish colleagues pronounced the German word with a Danish accent. The technology originated in Germany, and the old instruction manuals from the 1970s are where the term first became established.

“The idea to revive a slow sand filter came directly from practice,” Silva explains. “A senior colleague contributed know-how from earlier projects on artificial groundwater recharge. Building on that, we worked with the engineering consultancy Envidan to develop the design.”

## **Deliberately low-threshold – and therefore easy to replicate**

The BEOF team installed the sand filter right next to the Svaneke wastewater treatment plant, starting with a small scale pilot. The installation is essentially a plastic cylinder about two metres high and two metres wide, filled with a 20 centimetre layer of crushed granite and 80 centimetres of sand. A hose pump feeds the already treated wastewater into the filter. Once filtered, the water flows into an intermediate tank where it can be drawn off for agricultural irrigation. Sampling points and online sensor connections were also included to support monitoring and operation.

From the outset, the aim of the Bornholm pilot was to produce fit for purpose water for agricultural irrigation, directly adjacent to the wastewater plant and aiming for EU quality class D. The team therefore considered key factors for creating a local water loop: short transport distances, low energy use and simple distribution options, for example via tanker trucks or inexpensive PE pipes to neighbouring fields. This low-threshold approach was intentional, making the solution easy to replicate and adapt elsewhere. Low tech, low cost, robust and energy efficient – these characteristics were meant to make the SSF approach attractive across the Baltic Sea region, especially for places wanting to move quickly from discussion to hands on implementation.

With relatively little effort, slow sand filters can create new small recycling loops within the larger water cycle and make water available for agriculture in dry periods. Not drinking-water quality, but water clean enough for irrigating edible plants or growing seeds. On Bornholm, a local farmer was immediately willing to test the sand-filtered water on open fields. “We wanted the setup to be so simple that farmers can easily understand how it works,” says Silva. “A reliable tap point with predictable quality, and clear arrangements for distribution and storage.” What actually happens on the fields, however, is ultimately defined by regulation.

## **Recycled water shows strong vertical plant growth**

And it was precisely at this point that big politics suddenly got in the way of the small, ambitious pilot. Denmark’s Ministry of Agriculture had opted out of the EU Water Reuse Regulation, arguing that water recycling for agriculture was not relevant and offered no viable business case nationally. This removed the regulatory basis for the planned field tests with nearby farmers.

But the BEOF team refused to be discouraged and quickly shifted course. Instead of irrigating open fields, the pilot was reconfigured as a controlled small-scale test bed. Directly next to the sand filter, a test greenhouse was built in cooperation

with another EU project. Water from the sand filter was pumped from the intermediate tank into a second tank next to the greenhouse and delivered to the plants via drip irrigation. This setup offered a safe, controlled environment to validate water quality, observe plant reactions, and fine-tune system operation. Even on this smaller scale, the team would be able to demonstrate the treated water's readiness for use and build acceptance. "You can't wait until the regulatory framework is perfect," Silva says. "In the greenhouse, we can test the recycled water safely, collect data, and show the benefits."

## Unexpected gamechanger: new EU directive forces a rethink

Spinach plants at the local Frennegaard farm were among the first to be irrigated with the recycled water. They grew well – an important proof point. At the same time, the team undertook extensive outreach: to local farmers, municipal officials and other regional stakeholders. A workshop organised with the farmers' association combined a demonstration visit at the Svaneke plant with discussions about practical and regulatory issues. While national policymakers had opted out of water reuse, local farmers on Bornholm showed clear interest. They saw a business case: recycled water could be valuable during increasingly frequent drought periods.



*Test bed: spinach grown on recycled water*

These first farmers, already affected by drought, were not deterred by the political headwinds and engaged in lively discussions about legal hurdles, fair cost-sharing and very practical questions – above all, how the water would actually reach the fields where it was needed. This combination of on-site demonstration and open dialogue proved to be an important door-opener. "Often the psychological barrier is bigger than the technical one," Silva notes. "Once people see the system and observe the first results, acceptance grows."

None of this was in vain. Soon it became clear how quickly the political winds can shift—and how a pilot project can regain political momentum. In November 2024, the new EU Urban Wastewater Treatment Directive (EU 2020/3019) was published, requiring water reuse to be considered whenever large wastewater treatment plants are upgraded – and this time, EU member states cannot opt out. Denmark must now align with the new rules, and BEOF on Bornholm already has a functioning demonstrator, complete with data, technology, and committed partners.

## “Suddenly, everyone is talking about water reuse in Denmark again.”

Suddenly, the team found themselves in the right place at the right time. When the political context shifts, even a small project can have major impact: the Bornholm sand filter helps anchor the renewed national debate on water reuse with a tangible example. BEOF’s success cannot yet be measured in cubic metres



*Recycled water storage right next to the greenhouse*

of recycled water. But the island has shown that water recycling is not a future vision but an actionable option using available means. Or, as Paulo Silva puts it: “We wanted to prove that it works – and we have contributed significantly to the national debate on water recycling.” In Denmark, the signs now clearly point toward scaled-up use of slow sand filter technology.

In the broader Baltic Sea Region, they do so anyway. As a low-threshold technology, it is a “low-hanging fruit” that can be picked relatively easily elsewhere.

## Not a self running solution – many questions remain

Nevertheless, slow sand filter projects do not run themselves. Many details remain open – an issue that repeatedly surfaced in the Q&A sessions at WaterMan partner meetings. Under which site and operating conditions is the SSF most effective? How can the large space requirements for slow sand filter systems intended to treat agriculturally relevant volumes of water best be managed? Which micro-

pollutants are removed to what degree, and where might additional treatment stages such as activated carbon be necessary? What are feasible timelines for commissioning? What clogging frequency and maintenance intervals should be assumed in operational planning? And what are realistic operating and maintenance costs? Each of these questions depends on local context and requires careful consideration.

But the general direction is clear. “Water is a limited resource—even in the north,” says Silva, who comes from Portugal. “The faster we add local loops, the more resilient our water supply becomes. The slow sand filter is one building block among several—but an extremely accessible one.”

This is precisely the idea behind WaterMan: integrating small, pragmatic loops into the larger water cycle, sharing data, building acceptance, and enabling scaling. Change starts locally. Another core principle strongly confirmed by the Bornholm slow sand filter pilot.

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## About the WaterMan project

*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.*

More information: <https://www.eurobalt.org/WaterRecyclingToolbox/>  
<http://interreg-baltic.eu/project/waterman>

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