Interreg Baltic Sea Region

Co-funded by the European Union

AALBORG UNIVERSITY

SUSTAINABLE WATERS

NURSECOAST-II

Nanobubbles, Constructed Wetland, and Seasonality: Possibility for water and nutrient reuse

Place: Rønne, Denmark | Date: 08-11-2023
Speaker: Giacomo Messina

interreg-baltic.eu/project/nursecoast-ii-interreg-baltic-sea-region/

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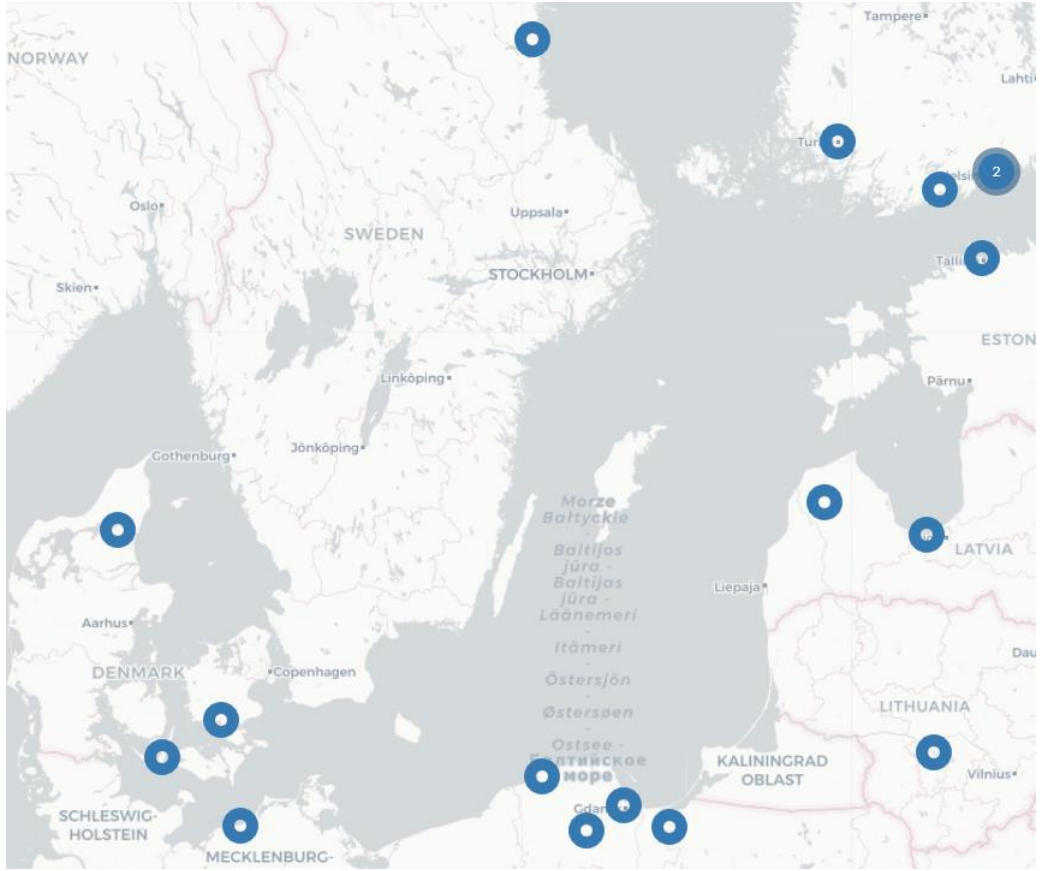
Nursecoast-II

Overview of the project

- 17 partners around the Baltic Sea
- 8 countries involved
- 6 pilot plants



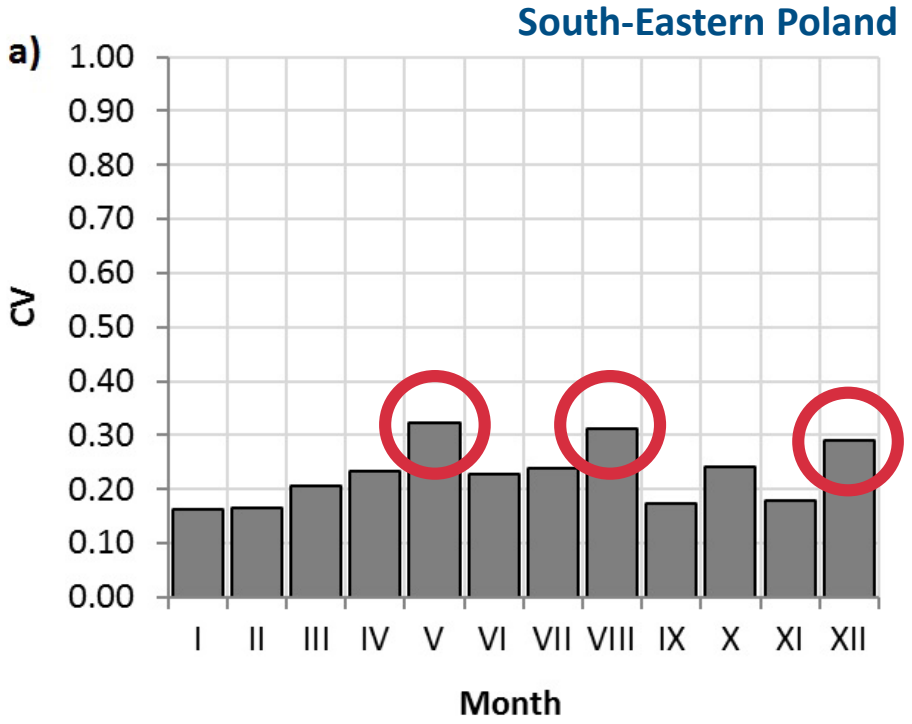
Nursecoast-II

What is the problem addressed?

High Seasonality: High variability of wastewater flow due to seasonality in the Baltic Sea tourist regions.

Peak Tourist Periods: Significant increase in wastewater flow compared to the rest of the year.

Wastewater Flow Fluctuations: The challenge is to address fluctuations in wastewater flow in response to varying tourist seasons.



https://doi.org/10.12911/22998993/154034

Nursecoast-II

How technology can improve Water Reuse?

Project Goals: NURSECOAST-II seeks eco-friendly wastewater treatment methods to minimize nutrient discharges in tourist areas, supporting SDGs 6 (**Clean Water and Sanitation**), 14 (**Life Below Water**), and 15 (**Life on Land**).

Holistic Approach: The project adopts a comprehensive approach, including pilot testing of wastewater technologies, such as **Constructed Wetlands** and **Nanobubbles**, contributing to SDGs 9 (**Innovation**), 11 (**Sustainable Communities**)and 12 (**Responsible Production**).

Improving water quality

Sustainable technologies

Enhancing wastewater treatment plant

Promoting sustainable practices

Preserving marine ecosystems

Mitigating land-sea pollution

Nanobubble Technology

Næstved Pilot Plant

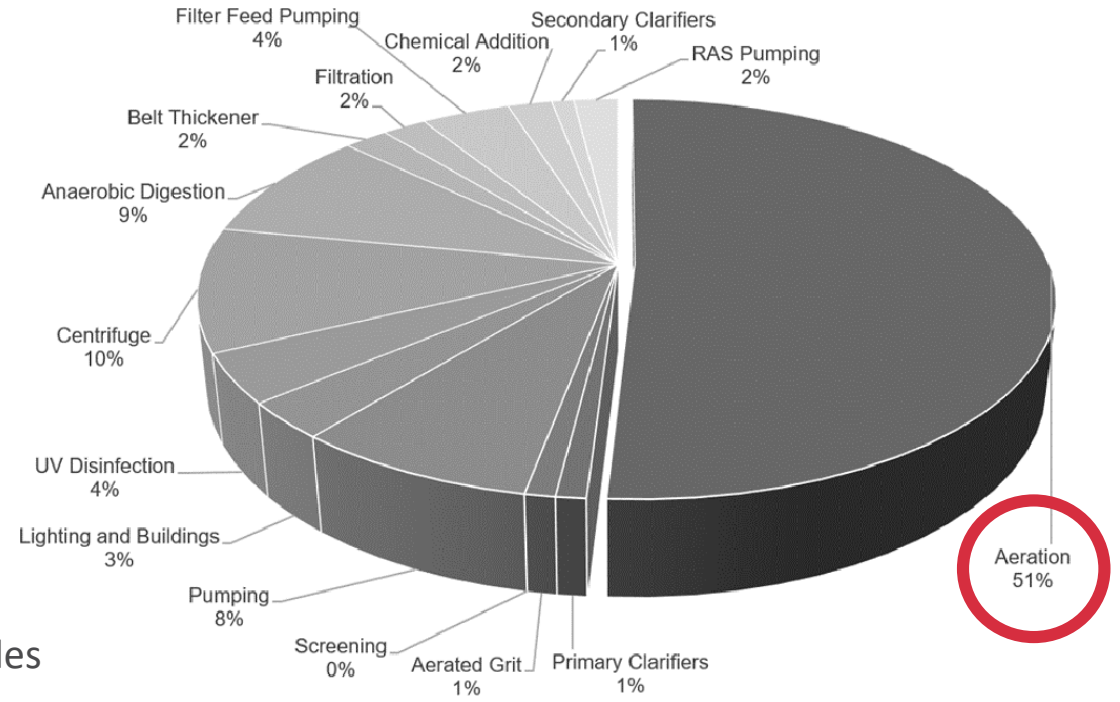
Located within NK Forsyning, an existing municipal wastewater treatment facility, the Næstved pilot plant focuses on the development of effective water treatment solutions. While NK Forsyning primarily deals with wastewater treatment, the pilot plant aims to enhance wastewater management practices.

Nanobubble Technology

What is the problem addressed?

Problem: High energy consumption in the mechanical aeration of the wastewater treatment process in the original plant.

Solution: Pilot plant that uses a nanobubble generator instead of a mechanical aeration system to reduce energy costs.



A techno-economic comparison between use of fine and coarse bubbles found that an operating **cost saving of approximately 20% could be achieved using finer bubbles.**
(Sanderetal.,2017, doi.org/10.2166/wst.2016.571)

doi:10.3390/pr7050311

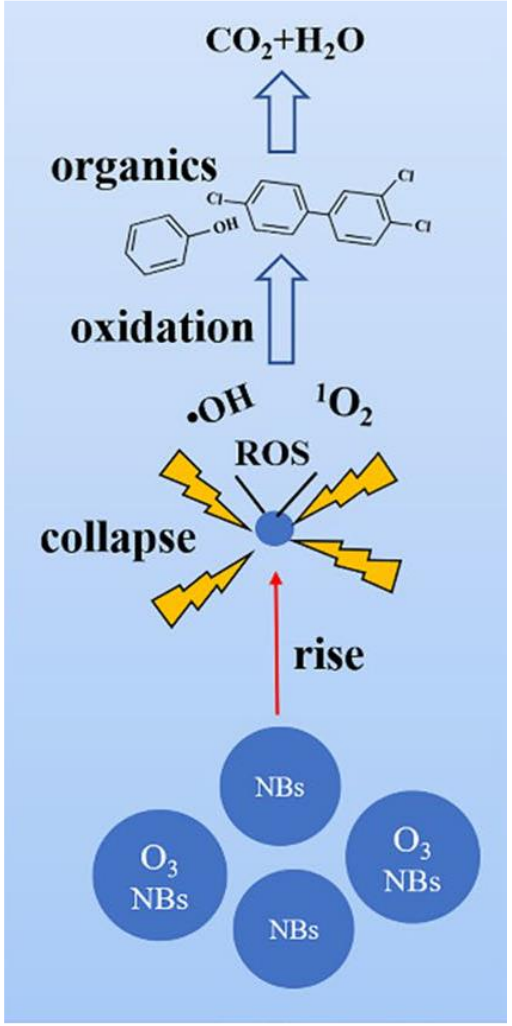
Nanobubble Technology

What is Nanobubble technology?

Description: Small air bubbles, measuring between 100 and 300 nanometers, tinier than conventional air bubbles used in wastewater treatment.

Suspension Time: Remarkable ability to remain suspended in water for extended periods, enhancing oxygen transfer rate.

Environmental Benefits: Minimizing energy consumption in aeration processes.



doi.org/10.1186/s13568-021-01254-0

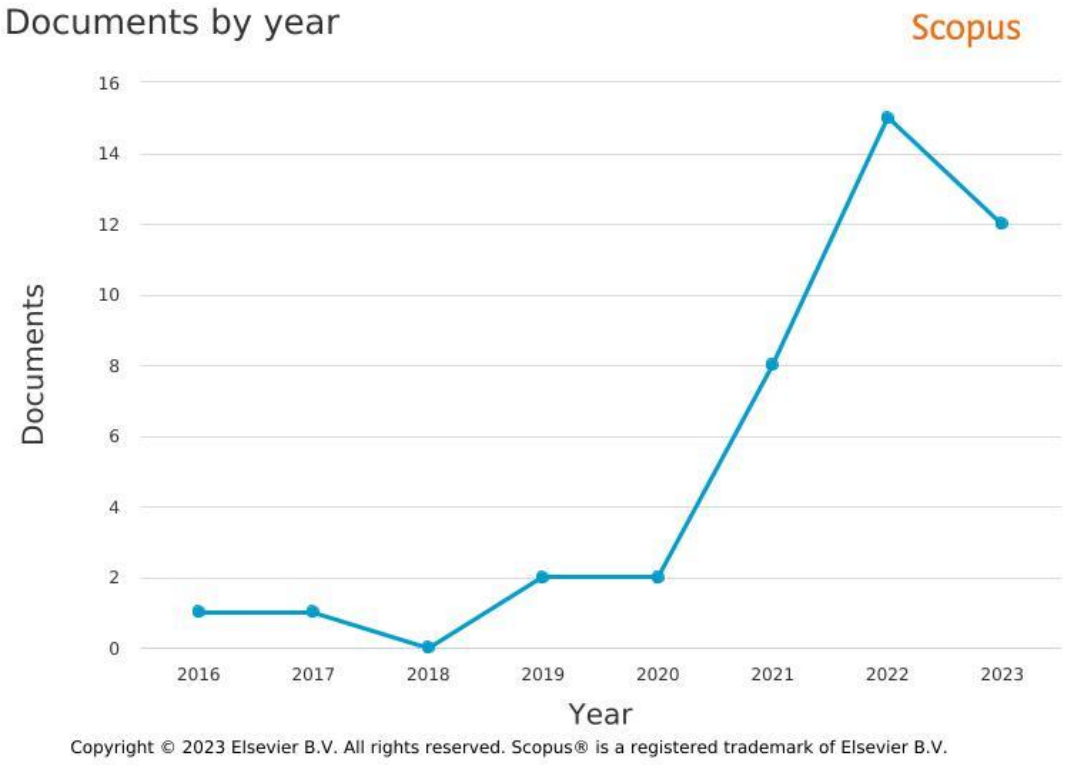
Nanobubble Technology

Why it is promising?

Strategic Choice: Nanobubble technology was chosen for its ability to enhance aeration efficiency, reduce energy costs, and improve the overall process.

Promising Potential: It offers an environmentally friendly approach to wastewater treatment, promising to degrade micropollutants and it is adaptable to existing facilities.

Objectives: The choice aims to save energy, improve treated water quality, and promote sustainability in wastewater treatment processes.



Constructed Wetlands

Langeland Pilot Plant

Located within the Danish Natur Fund, the Langeland pilot plant focuses on local water treatment and its subsequent reuse for irrigation purposes. This initiative plays a vital role in demonstrating the practicality of water recycling and its positive impact on the environment.

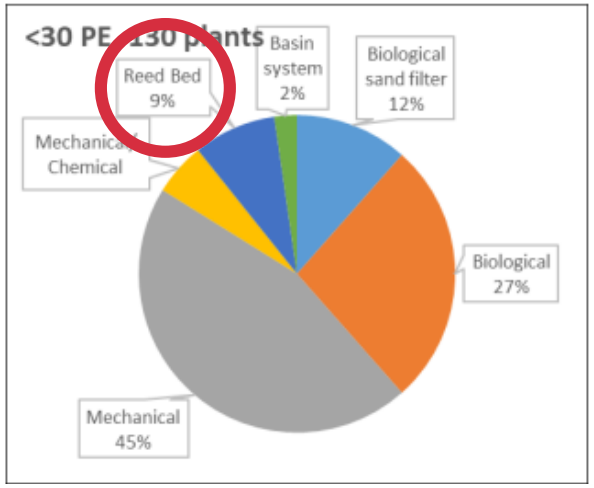
Picture provided By Kilian Water

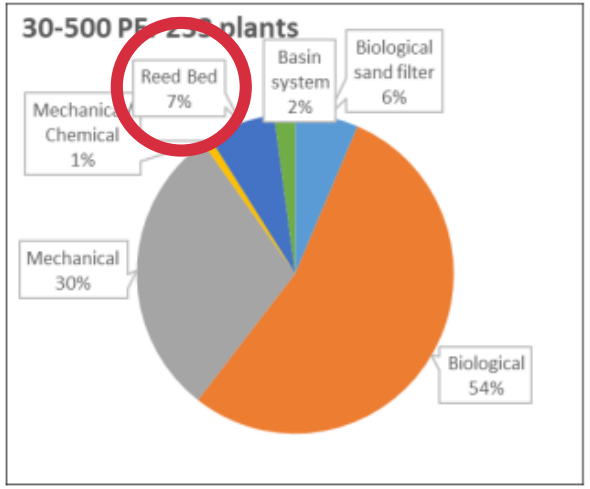
Constructed Wetlands

What is the problem addressed?

Problem: Initial wastewater disposal through a septic tank, which necessitated a more efficient solution.

Solution: Developing a Constructed Wetland-based system with bottom-forced aeration for improved wastewater treatment efficiency, lowering the required area and subsequent irrigation of nearby fields.





doi-org.zorac.aub.aau.dk/10.1007/s13762-022-04442-y

Constructed Wetlands

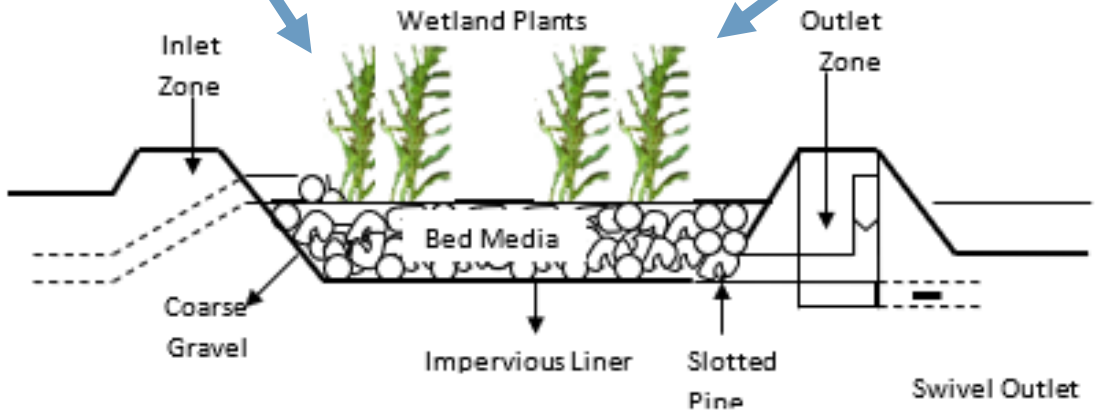
What are Constructed Wetlands?

Description: Constructed Wetlands are natural treatment systems using vegetation, soil, and microbiological processes to purify wastewater.

Characteristics: These systems mimic natural water filtration processes and utilize plants and microbial activities to remove contaminants.

Environmental Benefits: Constructed Wetlands offer eco-friendly wastewater treatment, reducing costs and environmental impact.

and or



10.29121/granthaalayah.v9.i8.2021.4176

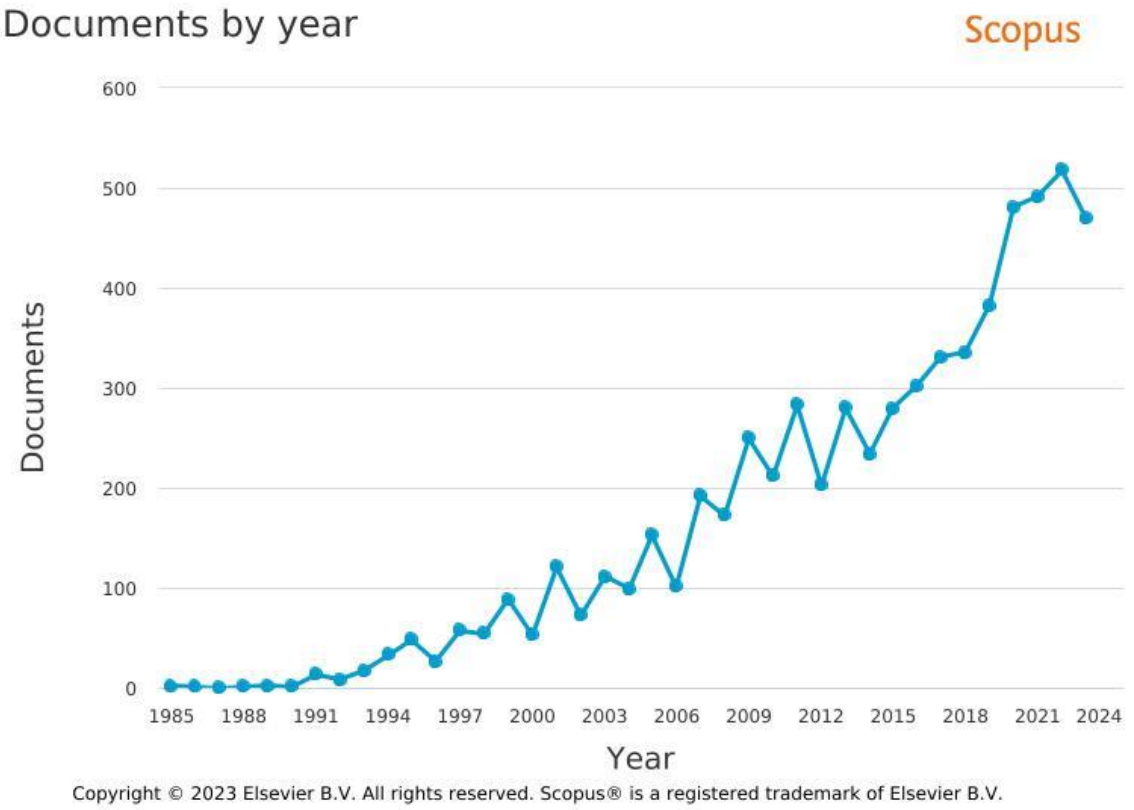
Constructed Wetlands

Why it is promising?

Strategic Choice: Adoption of Constructed Wetlands as a natural and ecological wastewater treatment solution.

Promising Potential: This technology shows potential to enhance efficiency, lower costs, and reduce environmental impact.

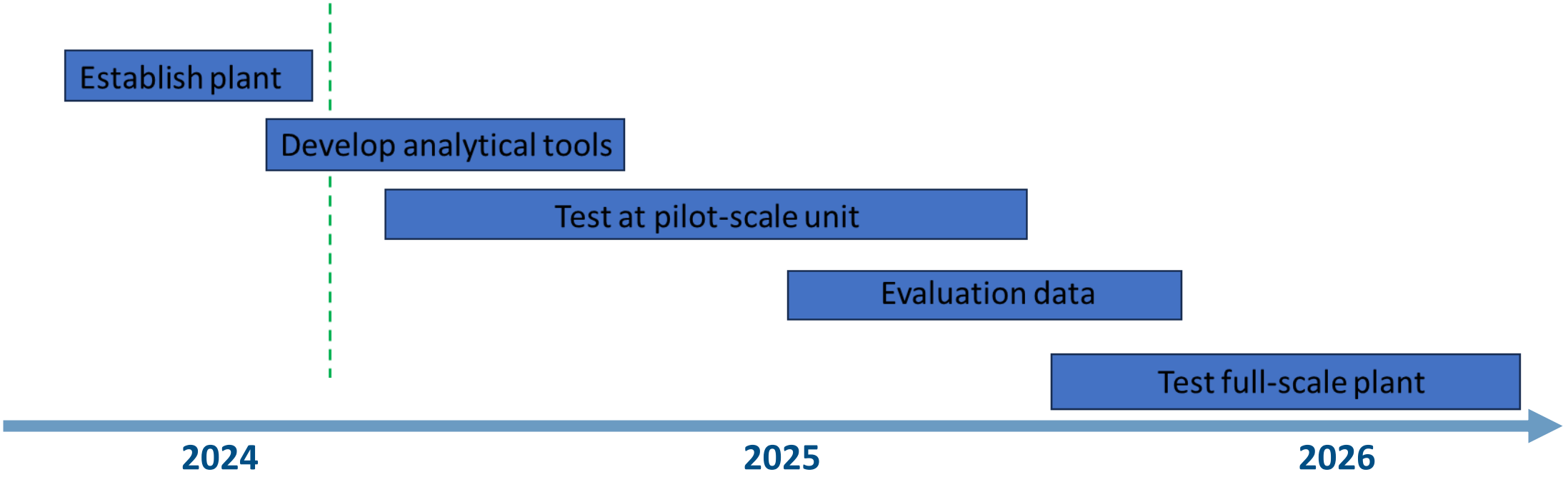
Objective: Integrating Constructed Wetlands with bottom-forced aeration to address wastewater treatment challenges and promote water resource sustainability.



Future prospectives of the project

Nanobubble Technology

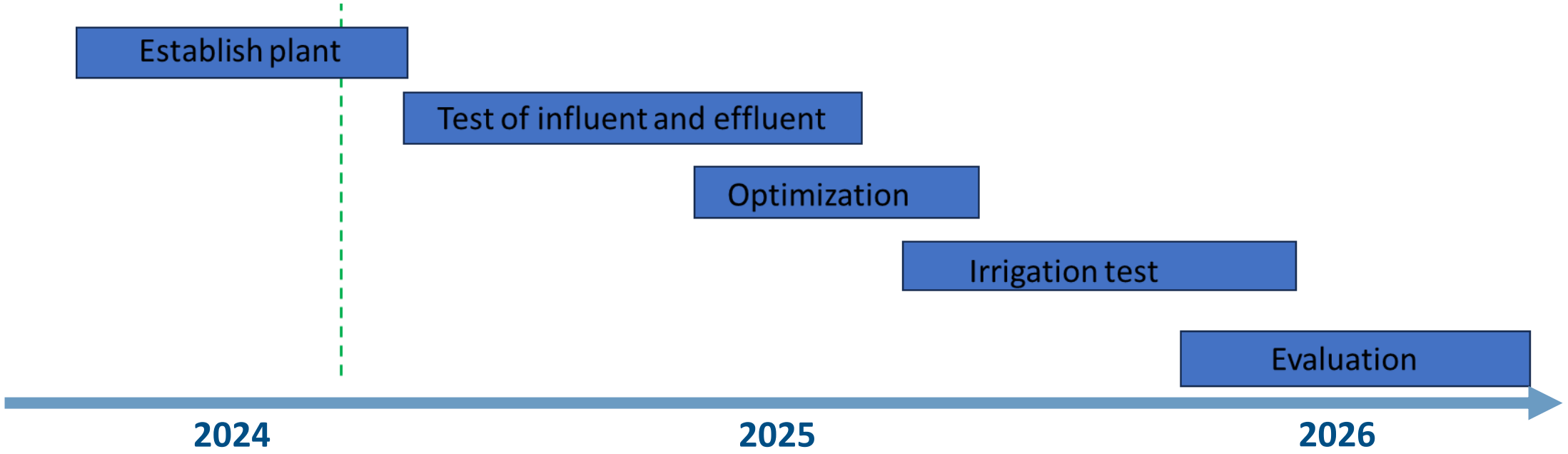
- Development of a method for measuring nanobubble concentrations in wastewater.
- Measure the concentration of free radicals generated when nanobubbles burst.
- Evaluation of settling rates to determine the impact of nanobubble on settling activated sludge.



Future prospectives of the project

Constructed Wetlands

- Construction and establishment of the wetland are complete.
- The project is transitioning to research phase.
- Upcoming research activities will focus on strategies to improve phosphorus removal when irrigation isn't possible.



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Thank you for your attention!