



LIFE GREEN
ADAPT

1st Innovation Workshop

Lessons learnt throughout technical development

4 April 2025



With the contribution of the LIFE Programme of the European Union under agreement No. LIFE20 CCA/ES/001795

1st Innovation Workshop Instructions



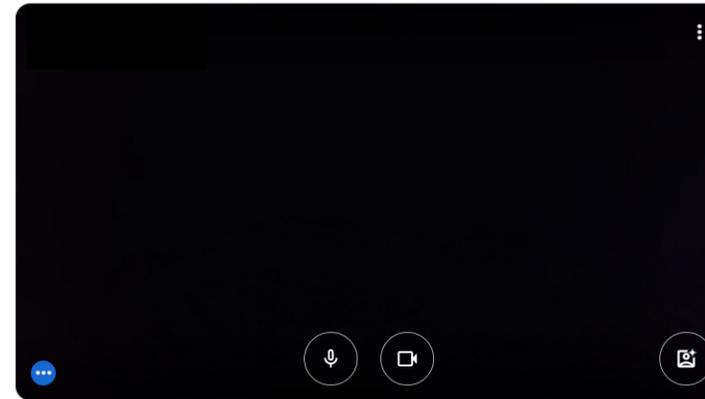
Please mute your microphone when others are speaking and raise your hand when you would like to speak. Otherwise, please write into the chat to converse.



We will record this meeting for internal purposes only, permitting us to work more effectively on post-meeting activities.



We will be using AI transcription as a further tool to capture and record the content of the workshop, enabling us to more easily conduct post-meeting activities.



LIFE GREEN ADAPT Innovation...

Scheduled for
Fri 4 Apr 10:00

Join anyway

Present

Use Companion Mode

Join and use a phone for audio

Show fewer options

1st Innovation Workshop Agenda

Time (CET)	Item
11:00 am -11:15 am	Welcome & Introductions to the IW
11:15 am -11:25 am	LIFE GREEN ADAPT Project Overview
11:25 am -11:45 am	Floating Treatment Wetlands (FTW)
11:45 am - 12:05 pm	Electroactive Biofilm-based Treatment Wetlands (EAB-TW)
12:05 pm -12:20 pm	Break*
12:20 pm - 12:40 pm	Aerated Vertical Flow Treatment Wetlands (GPs-AVTW) & Geopolymers (GPs) from Metakaolin (MK)
12:40 pm - 12:55 pm	Feedback & Discussion
12:55 pm - 13:00 pm	AOB/Meeting Closure

*Note: the break will be followed by an online group photo. Please turn on your cameras for this!

1st Innovation Workshop – Isle's Profile

**WE BRING
TECHNOLOGIES
TO LIFE**



Identifying Challenges

We collaborate with the world's leading utilities and technology end users. After establishing their challenges, we find solutions through the independent sourcing of innovative technologies.



Connecting Technologies

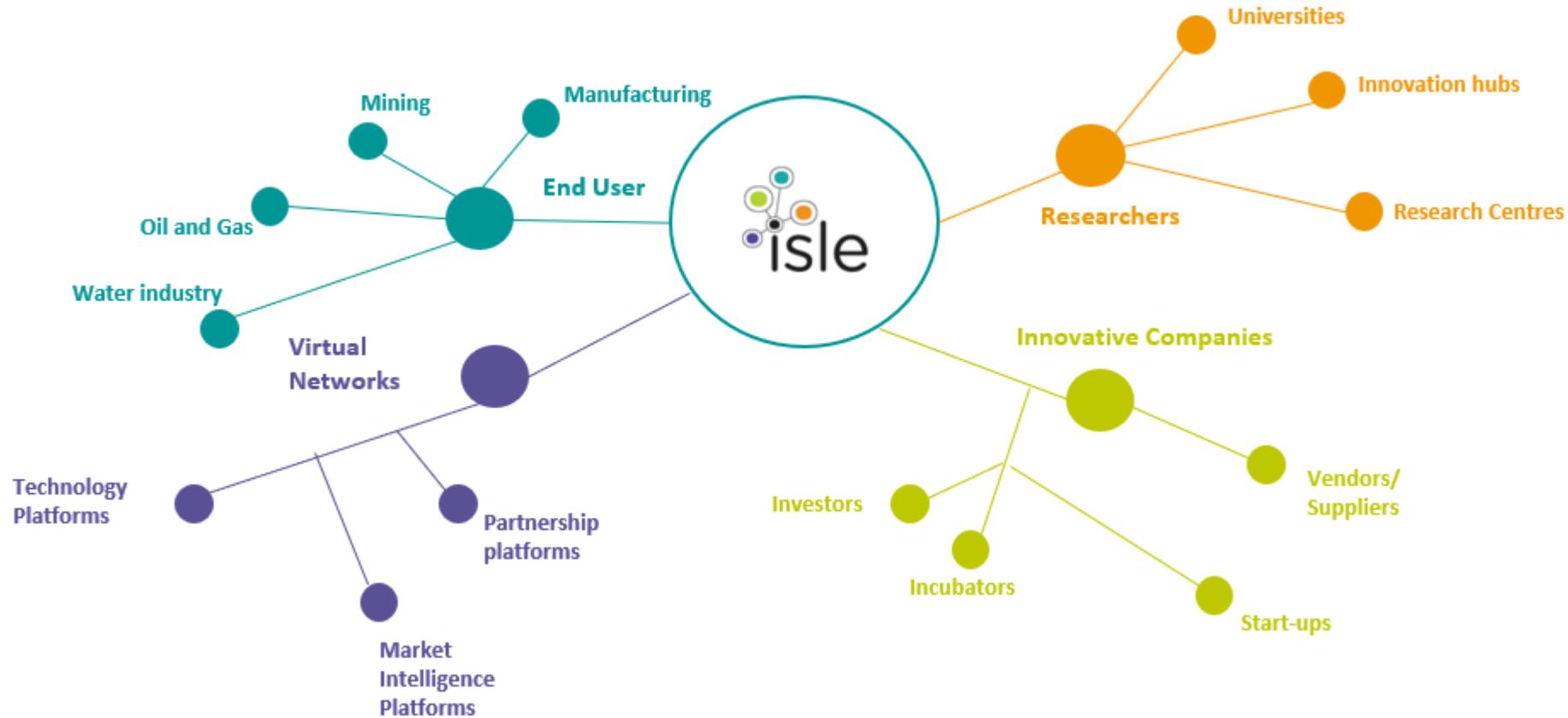
We provide market intelligence to technology providers, enhancing the commercialisation process through increased dialogue and understanding of prospective clients' needs.



Collaborative Evaluation

Our innovation forums collaboratively review emerging technologies in a peer-to-peer environment increasing opportunities for knowledge transfer and shared resources to support the uptake of technology.

1st Innovation Workshop – Isle's Profile



Isle has a track record of participating in EU funded projects, capitalising on our extended innovation network, knowledge and experience, to deliver high-impact, successful projects.

Isle has unlocked over €65 million of EU funding to work with more than 120 new organisations in Europe.

LIFE GREEN ADAPT: ISLE's Role

LIFE GREEN ADAPT seeks to develop waste infrastructure that is resilient to climate impacts and promotes a circular economy.

- Financial Framework: LIFE Programme
- Budget: €3,037,758
- Timespan: 54-month project (Jul 2021 – Dec 2025) → 1-year extension granted
- Demo site: As Samozas, Spain

Isle leads ACTION C3 and ACTION E1, E2 and E3.

Actions led by ISLE

ACTION C3

Boosting the implementation of LIFE GREEN ADAPT solutions

ACTION E1

Dissemination & communication strategy and materials

ACTION E2

Information and awareness raising

ACTION E3

Knowledge and lessons learnt transfer

As part of these actions, ISLE is tasked with the organisation and delivery of three (3) Innovation Workshops

LIFE GREEN ADAPT Innovation Workshops

What the workshops are

The Innovation Workshops will be held to connect project innovators with valued experts in the water sector. This synergy will ultimately provide innovators with relevant insights into bolstering adaptability and market integration feasibility of their technologies.

This will also foster relationships valuable to eventual replication, transfer, and scaling of the GREEN ADAPT technologies.

Why they are important

Many technologies fail to meet market requirements when they reach the commercialisation stage. Gathering feedback from the sector they are developed for could help prevent this.

Three (3) Innovation Workshops are planned that will raise awareness, provide key information and implement a process of co-understanding and co-creation of knowledge among innovators.



Expected outcome of the workshops

As the facilitator of the workshops, we will gather feedback from members of our Innovation Board to ensure GREEN ADAPT technologies are fit for purpose at the project end, and to ensure the development of post-project roadmaps for each technology whilst maximising robustness of results co-creation.

LIFE GREEN ADAPT Innovation Workshops Plan





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LIFE GREEN ADAPT Innovation Board



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LIFE GREEN ADAPT Innovation Board



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LIFE GREEN ADAPT Project Overview

Luz Herrero Castilla



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LIFE GreenAdapt



Green and nature-based solutions for climate change-resilient waste infrastructures



Budget – 3.04 M€
Timeline – 2021 to end of 2025
7 multiapproach partners

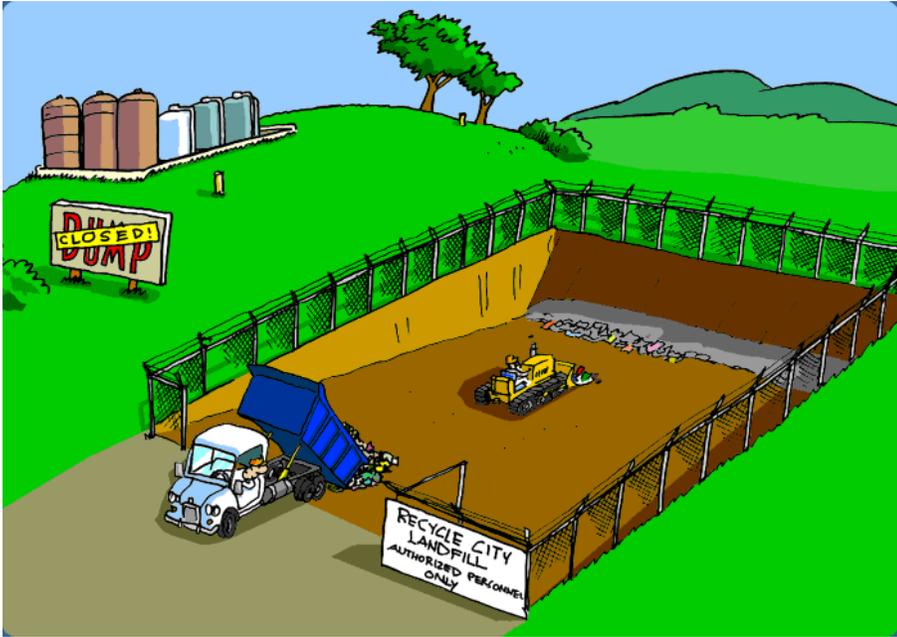
Partnership:



Coordinator



Industrial waste landfills



Landfill: where non-value materials are disposed.

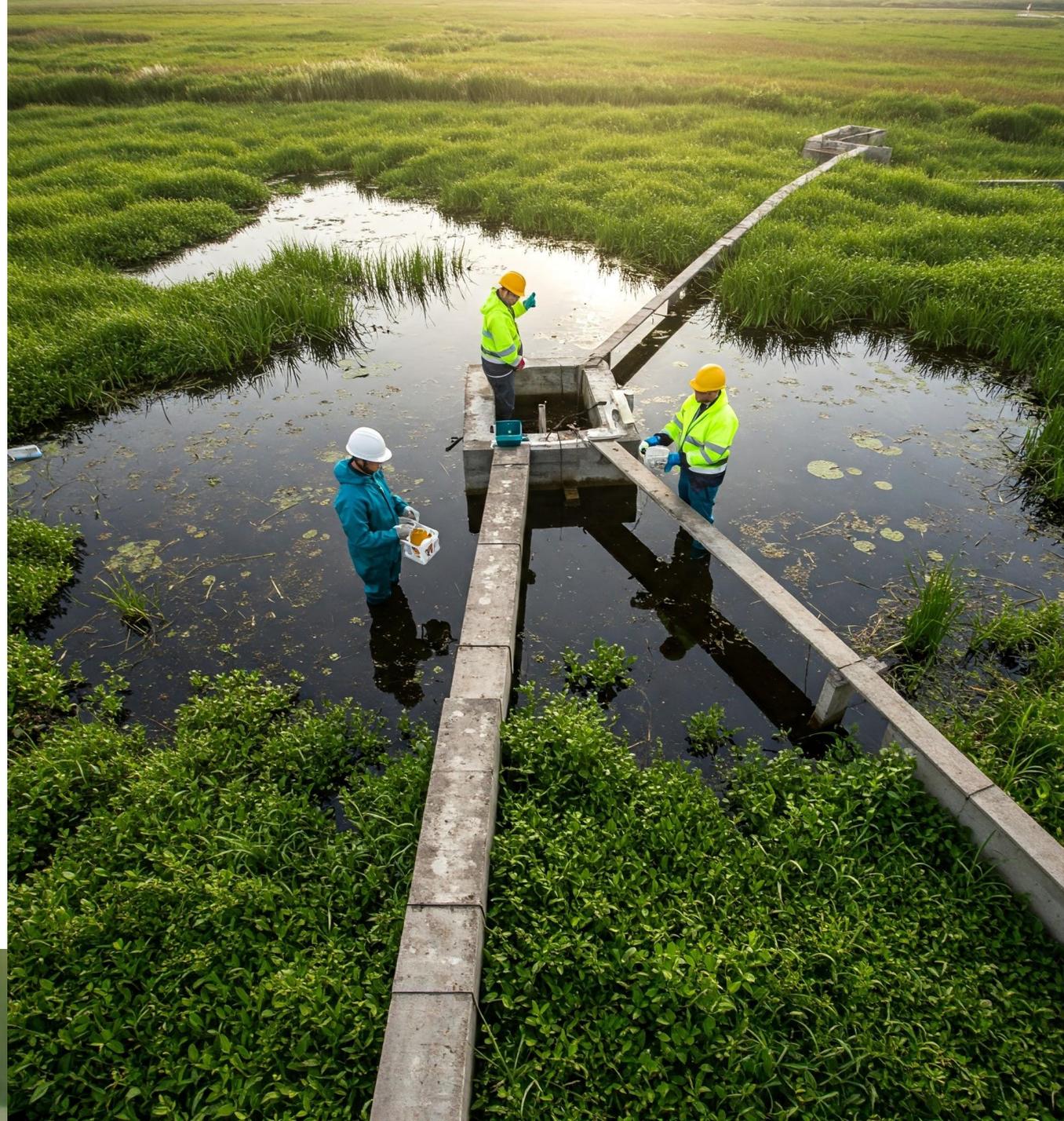


Highly polluted wastewater is generated...

- New rain-water patterns generates:
 - Leachate. Vastly polluted wastewater via percolation.
 - Runoff. Slightly polluted water.
- In absence of treatment, water to:
 - Natural bodies:
 - Rivers.
 - Groundwater reservoirs.

Main goals

- Nature-based solutions to:
 - Store and treat polluted wastewaters.
 - Reclaiming water for internal purposes.
 - Adapt landfills to climate change.
- Holistic approach:
 - Life cycle assessment.
 - Cost analysis.
 - Social impact.
- Dissemination and business plan:
 - Stakeholders' engagement.
 - IP and replicability.
 - Business models.



Demo-site location



Galicia – NW Spain

Nature based solutions for:

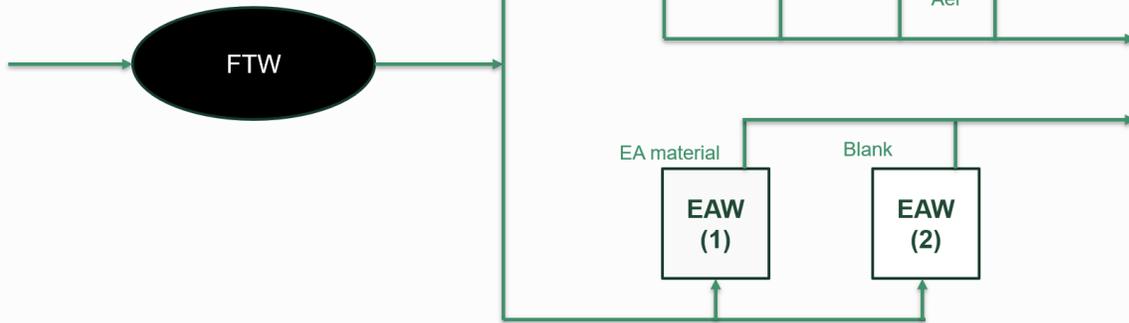
- **Leachate - 2-steps treatment:**

- Floating wetland as main treatment.
- Geopolymers aerated wetlands.
- Electroactive wetlands.

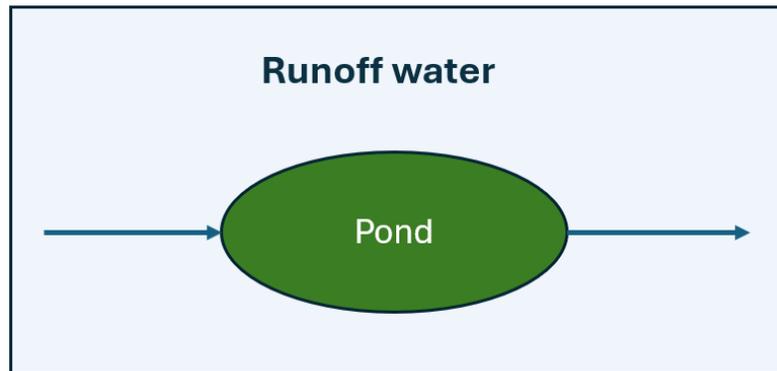
- **Runoff:**

- Single-step treatment.

Landfill leachate



Runoff water



Prototype's pictures

Leachate floating treatment wetland



LIMNOS

Runoff pond



Geopolymer aerated treatment wetland

aimen
TECHNOLOGY CENTRE



Electroactive wetland

AARHUS
UNIVERSITY

Next steps

- Finishing experimentation – currently **ongoing**
- Life cycle, cost and social impact studies – **ongoing**
- IP, exploitation – **ongoing**
- Business models and partnerships – **ongoing**
- Communication and dissemination – **ongoing**





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Thank you

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Floating Treatment Wetlands (FTW)

Alenka Mubi Zalaznik

Miran Renčelj

Anja Pugelj

Urša Brodnik



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Challenge: Limited Lechate Treatment in Ponds

Brown color, high ammonium, high concentrations of other ions, etc.

Very difficult environment for organisms to survive

	(2019-2022)	(2023-2024)
pH	8.42 ± 0.42	8.1
EC (mS/cm)	19.3 ± 8.4	20.9
TSS (mg/L)	78.2 ± 133.55	25
COD (mg/L)	3,333.5 ± 1,112.4	1.857
BOD ₅	910 ± 408.3	
NH ₄ ⁺ (mg/L)	1,818.4 ± 528.8	2.664
NO ₃ ⁻ (mg/L)	40.27 ± 35.98	64
SO ₄ ²⁻ (mg/L)	314.25 ± 163.85	189
Total P (mg/L)	18.1 ± 6.8	

- High concentrations of pollutants
- High costs of disposal
- Possible problems on WWTP



Can we reduce pollution?



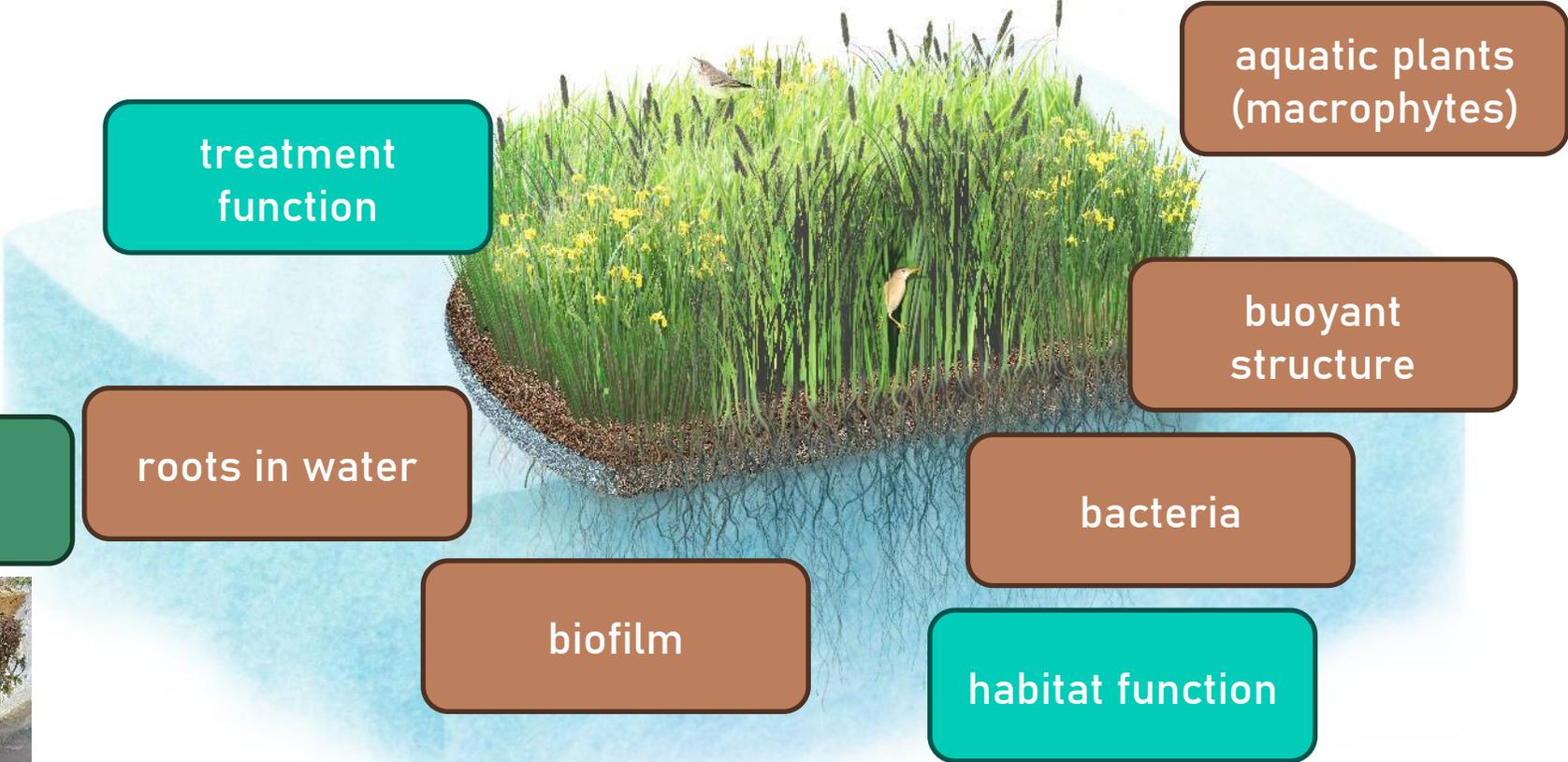
(Source: Xiloga)

Floating Treatment Wetlands (FTW)

- Where do they make the most sense?



Water treatment wetlands



FILTERING SEDIMENTATION PLANT UPTAKE ABSORPTION

Image Courtesy © UK landscape architects Grant Associates

FTW Alternative – Pond Aeration

	POND AERATION (Technical Equipment)	FTW (Passive NBS technology)
Main Function	Increases oxygen levels to enhance microbial activity and organic matter breakdown.	Enhance quantity and quality of biofilms and microbial processes, increasing organic matter breakdown
Key Mechanism	Aerators bring oxygen into the water.	Plant roots provide extensive surface area for microbial growth near surface/oxygen, supports microorganisms, provide oxygen in the vicinity of roots
Energy Requirement	Requires electricity.	Passive system.
Maintenance	Regular maintenance of aerators is required.	Non.

OPTIMIZATION: COMBINATION OF BOTH SYSTEMS

FTW for landfill leachate

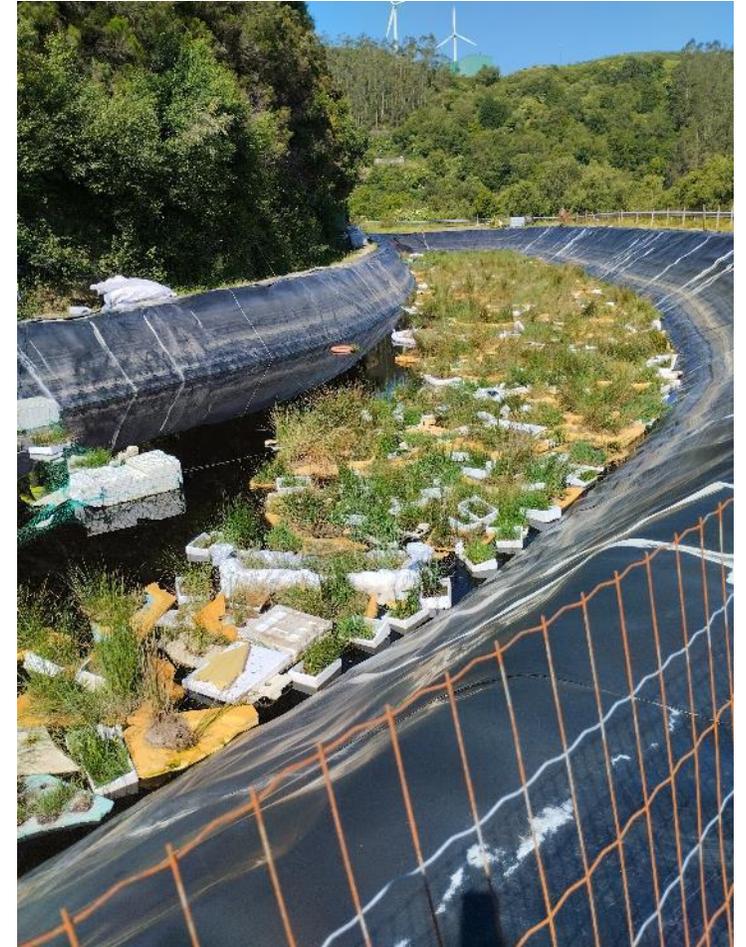
Testing since 2023

THESIS: FTWs will increase biological activity and lower pollution loadings

MATERIAL REUSE: FTWS are assembled from waste (styrofoam)

AREA COVERAGE: 50 %

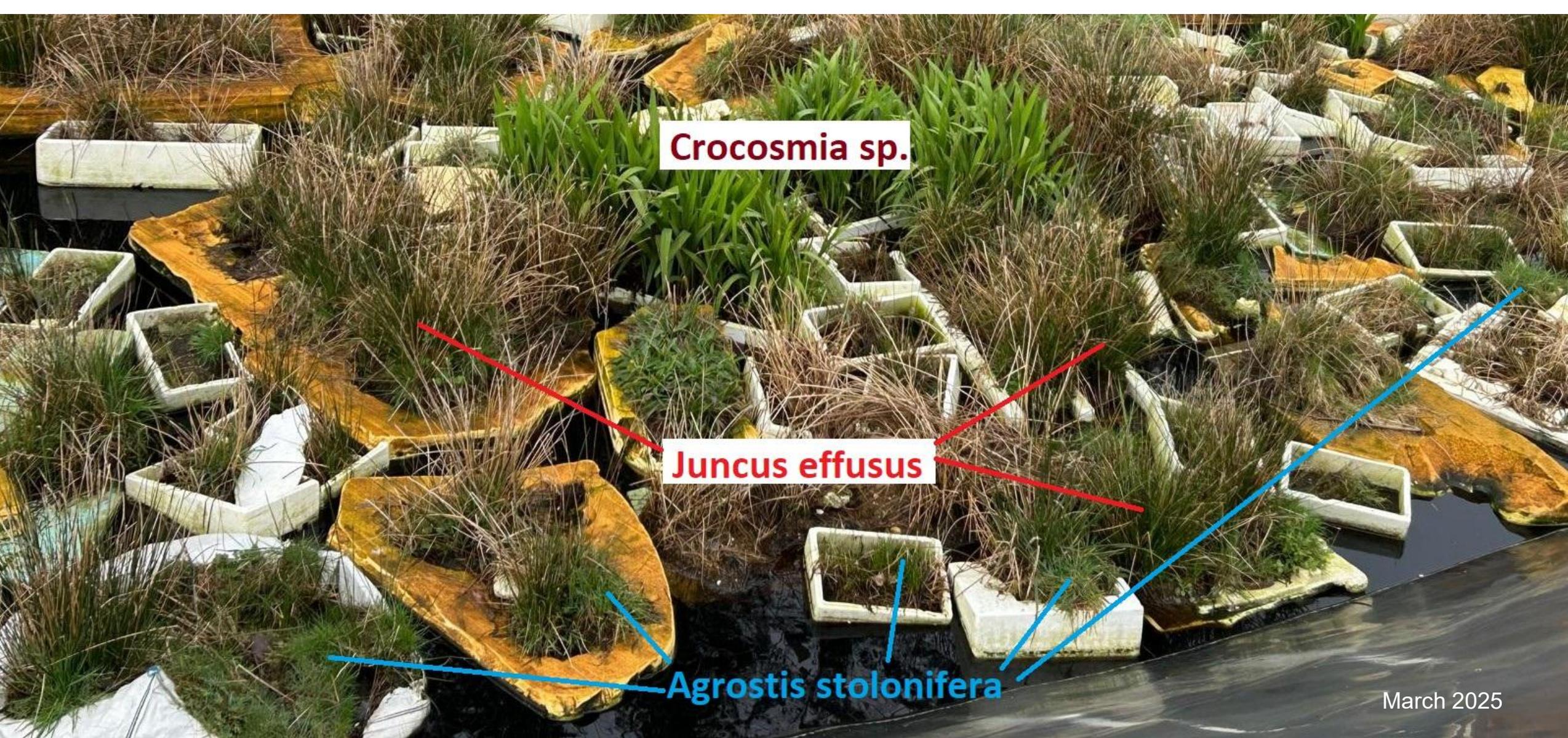
STABILITY: Anchored to the shores of the pond



Plants

- Roots are the surface, where most processes occur
- The biggest challenge: to find plants that could withstand difficult conditions.
- Early attempts: most planted plants died off (a combination of high pH and high ammonium concentrations)
- Eventually, min. three (3) plant species could withstand harsh conditions.
- **Growth of plants is crucial: keystone condition that makes this solution viable.**





Crocosmia sp.

Juncus effusus

Agrostis stolonifera

March 2025

Technical functionality

The **buoyant structure** must perform its basic functions:

- The material must provide enough buoyancy to hold plants above water level.
- The structure must enable plants to successfully grow through it
- The structure must be rigid enough, to enable plants to be firmly connected on the platform.
- The structure must be firm enough to withstand weather conditions (wind, waves).

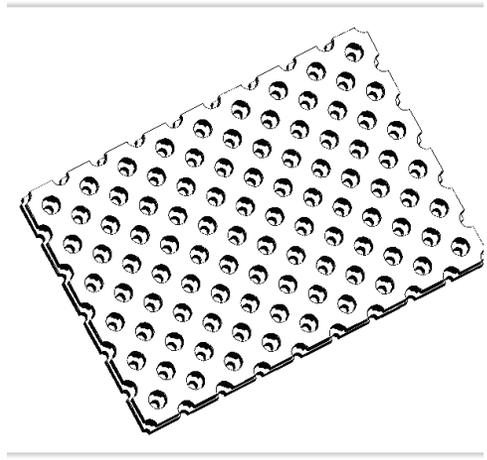
The problem of disposing of material after use. A mixture of different materials is much more difficult to properly recycle than single material platforms.



Next steps

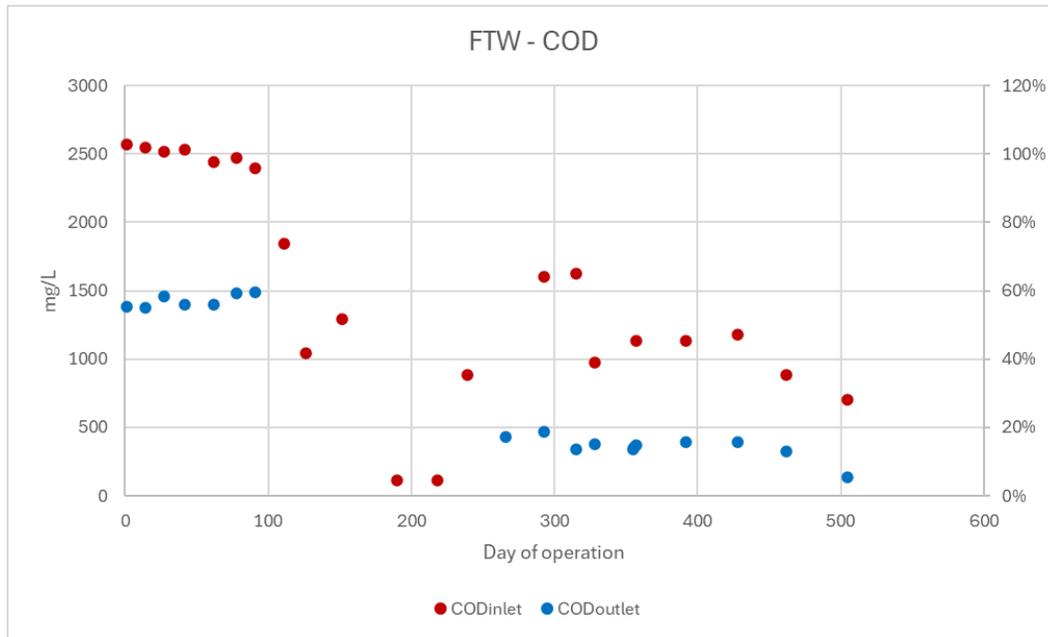
Next technical steps for continued development of technology :

- Developing an even better platform, (recently been performed by LIMNOS).
- New specially designed styriofoam platform has been developed, produced and tested.

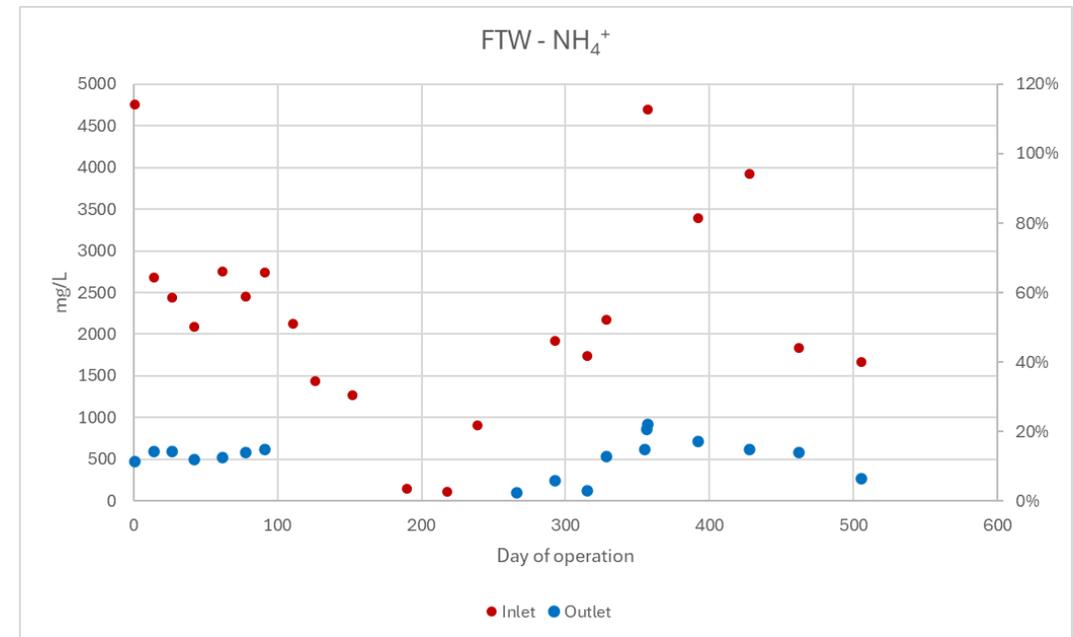


Efficiency Results (2023-2024)

COD: 57% ± 15%

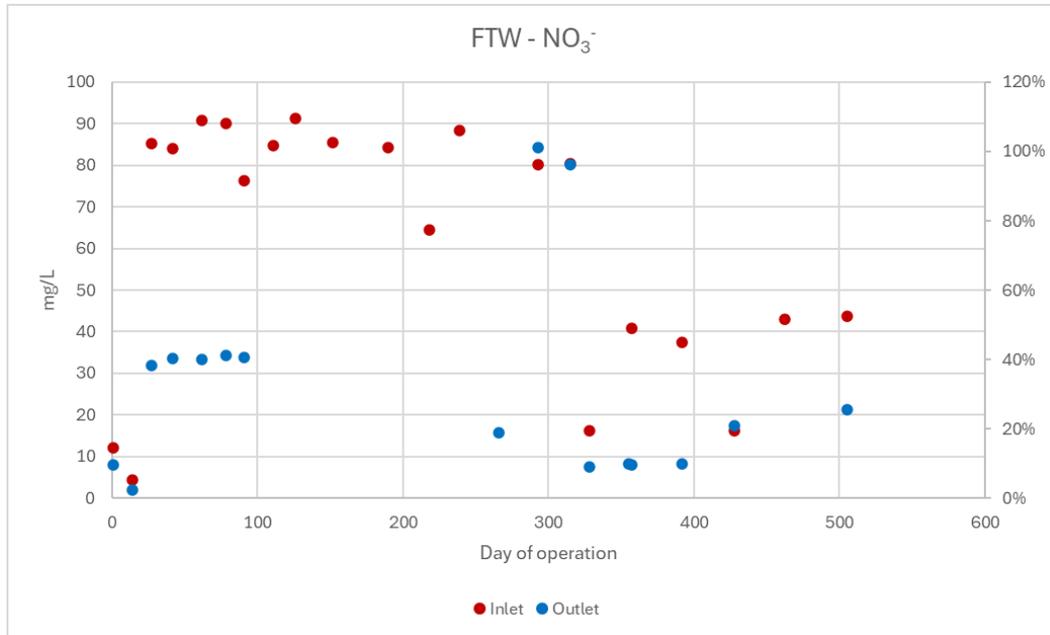


NH₄⁺: 80% ± 6%

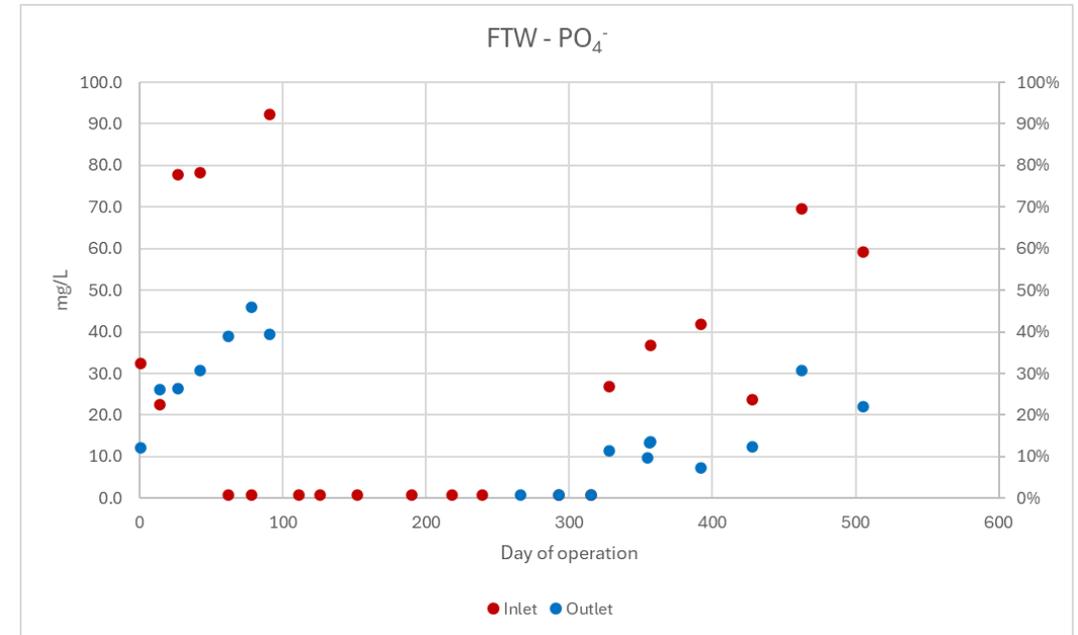


Efficiency Results (2023-2024)

NO₃⁻: 49% ± 32%



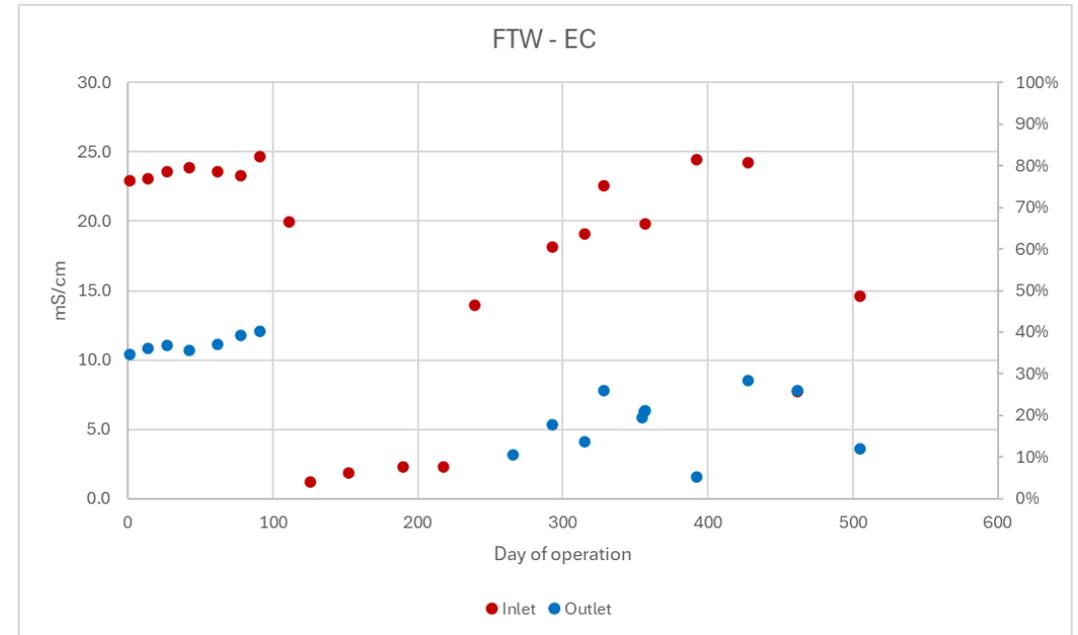
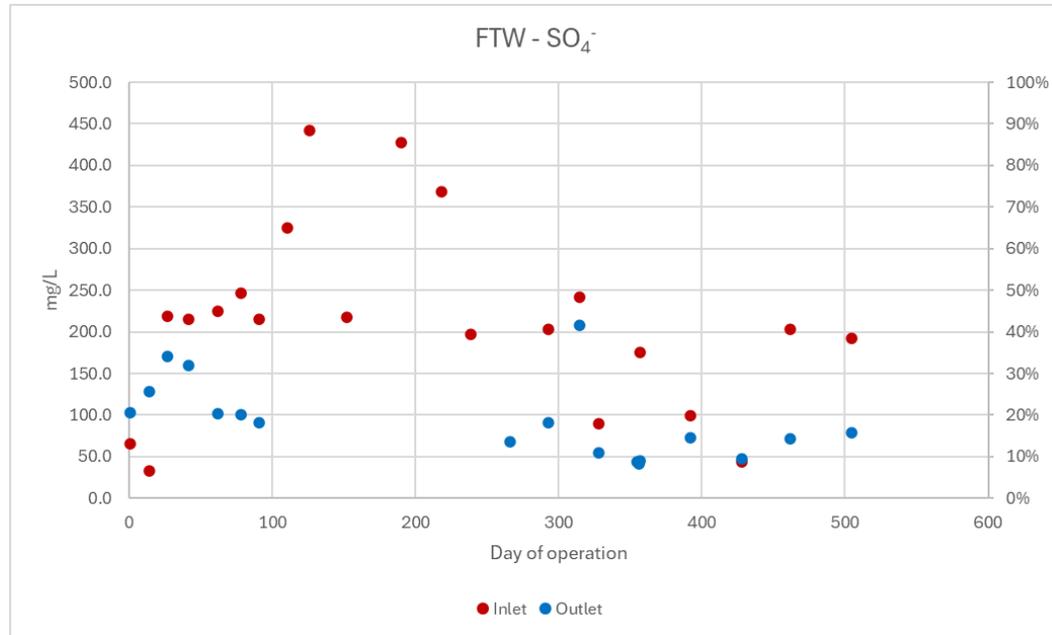
PO₄⁻: 51% ± 25%



Efficiency Results (2023-2024)

SO₄⁻: 46% ± 20%

EC: 59 % ± 20%



Performance and results

- pH has stabilized just above 8, which is good enough for some species to grow
- COD efficiency is around 60%, not bad
- NH₄ removal of around 80% is very encouraging, proving systems adequate efficiency
- NO₃ removal is another great result, proving the existence of the denitrification process
- PO₄ removal is very significant, this is a great benefit of more intensive sedimentation
- EC reduces significantly, ions adsorb on organic plant matter and sediment

- Since plants started to grow better only in recent times, even better performance is expected

Major benefits of the system

1. Large volume:

- *enables **dilution** of inflow,

- ***prolongs hydraulic retention times,**

- *provide space for **sedimentation** and **sediment storage.**

2. Simple system (to install).

3. Reliable and robust - almost nothing can go wrong.

4. A **buffer**, in case of increased inflow.

Conclusion

Considering the simplicity of treatment solution efficiency for all parameters is considered very satisfying.

Efficiency is in the range of most commonly used systems or better.

This is very encouraging, calling for broader use of this technology.

The plants started to grow better only recently; an even better performance is expected.



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LIMNOS Contacts

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Geopolymers (GPs) from metakaolin & aerated vertical-flow treatment wetlands (GPs-ATW)

Álvaro Silva Teira, Ph.D.



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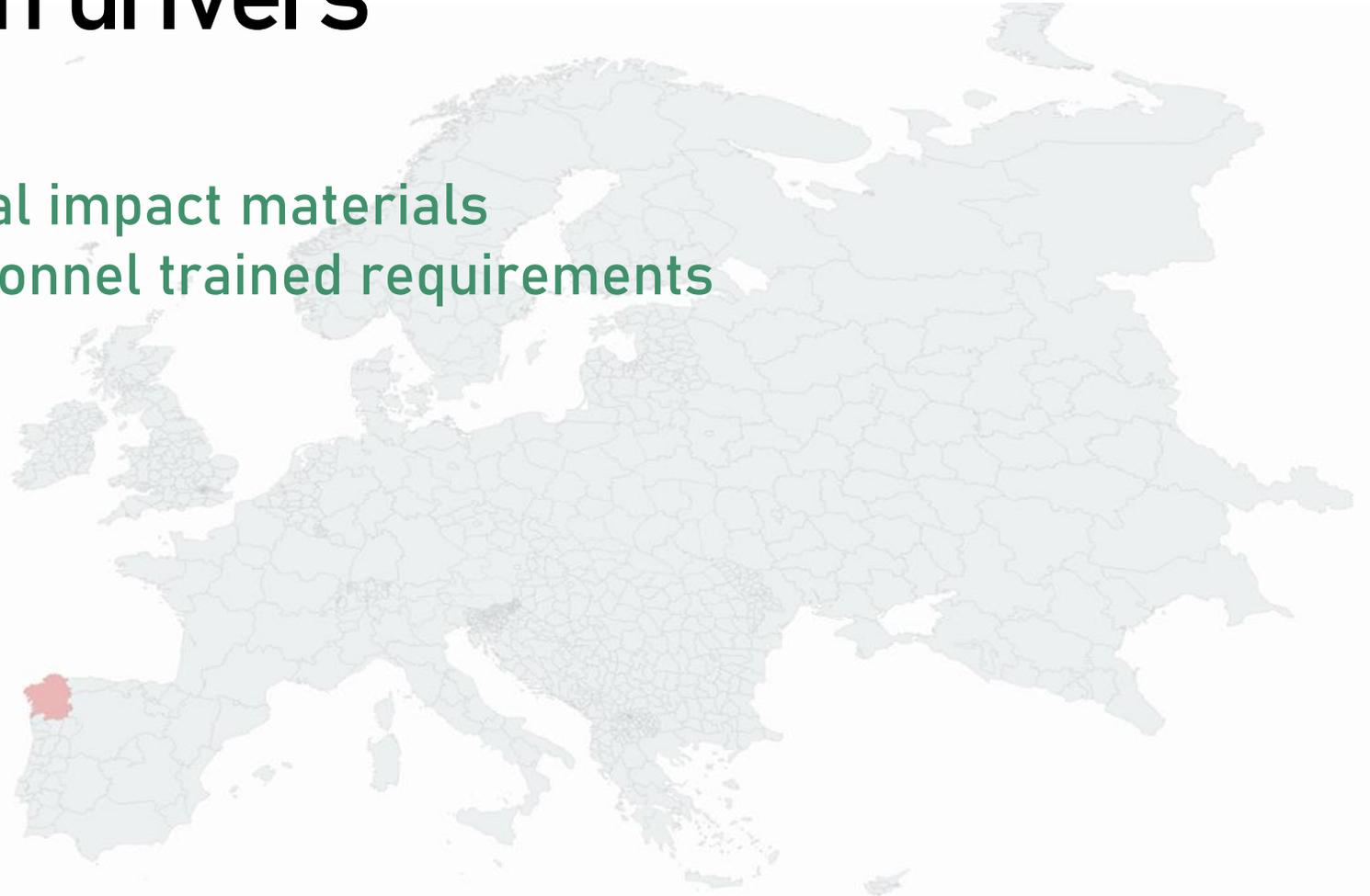
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Geopolymers (GPs) from metakaolin & aerated vertical-flow treatment wetlands (GPs-ATW)



Keywords and main drivers

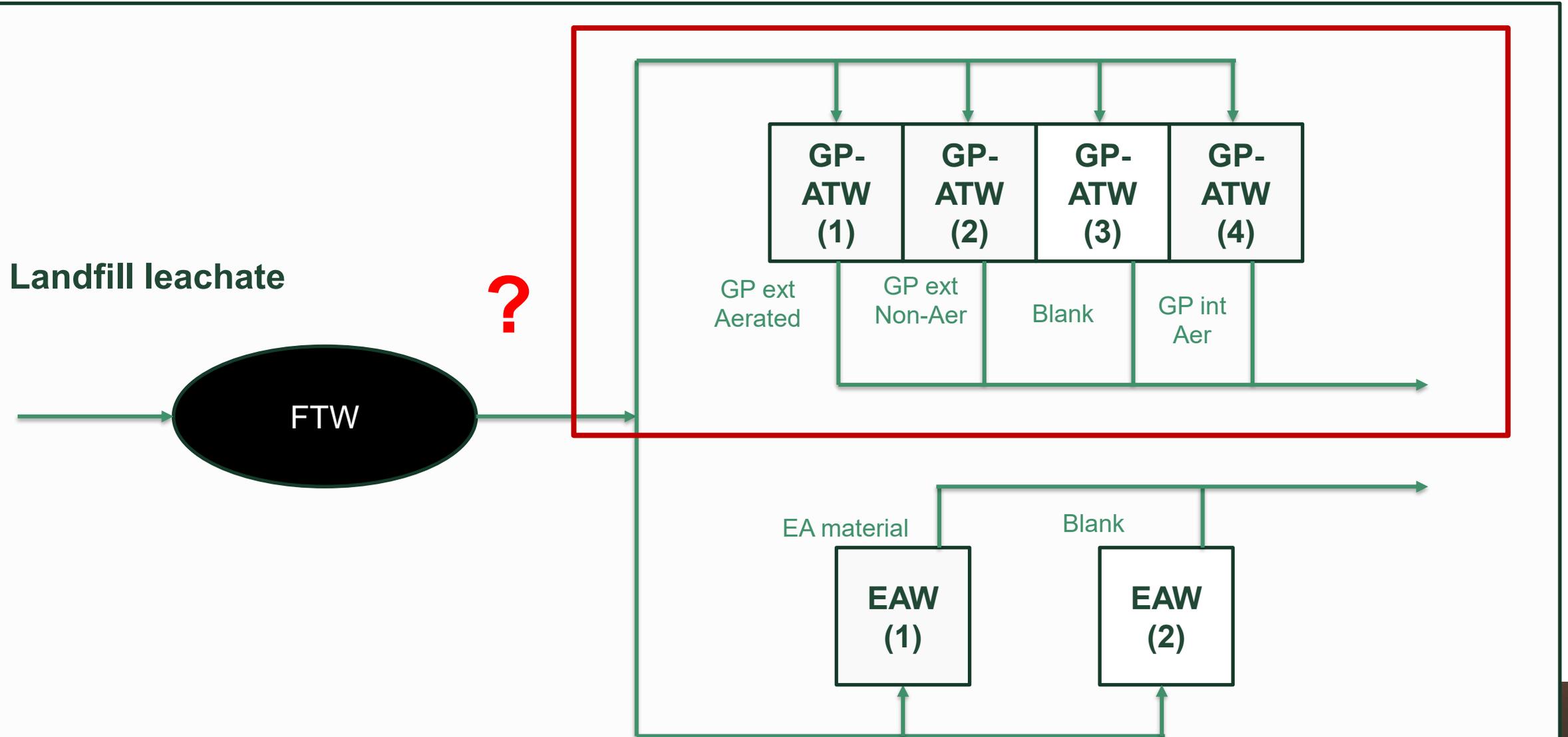
- Nature-based solutions
- Low-cost and environmental impact materials
- Low-maintenance and personnel trained requirements



- Galicia – Spain: large deposits of natural kaolin

Created with mapchart.net

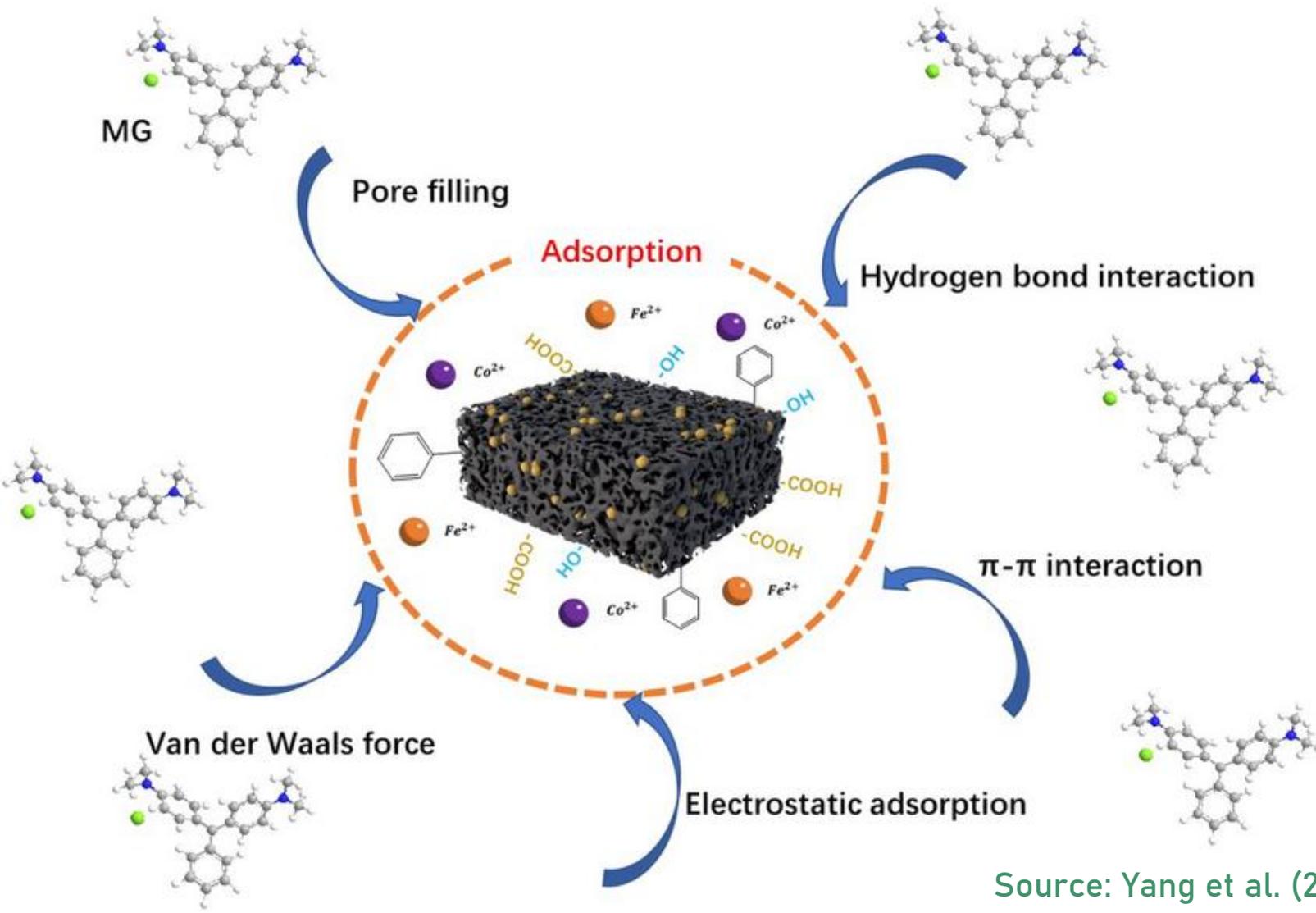
Flow-chart – link with the previous treatments



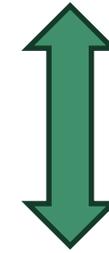
Advantages and barriers

Advantages	Barriers
Vast availability of materials in the geography	Need to develop an unknown productive process
Easily changeable material	Limited adsorption capacity of the material
Low-trained personnel needed to operate	Possibility of clogging caused by solids

Metakaolin - adsorption



- Organic C
- N
- P
- Others



- Porosity
- Electric activation

Physical – chemical *ad-hoc* process



Natural kaolin

Productive
process?



Customized
metakaolin

Key research questions

- H_2O_2 : NaOH
- MK : silicate
- Washing



- Curation time
- Temperature
- Sizing of pieces

Vast lab-work



GP - productive process



Massive production of MK



Customized
metakaolin

Geopolymer prototypes' construction

First coarse gravel



Aeration circuits

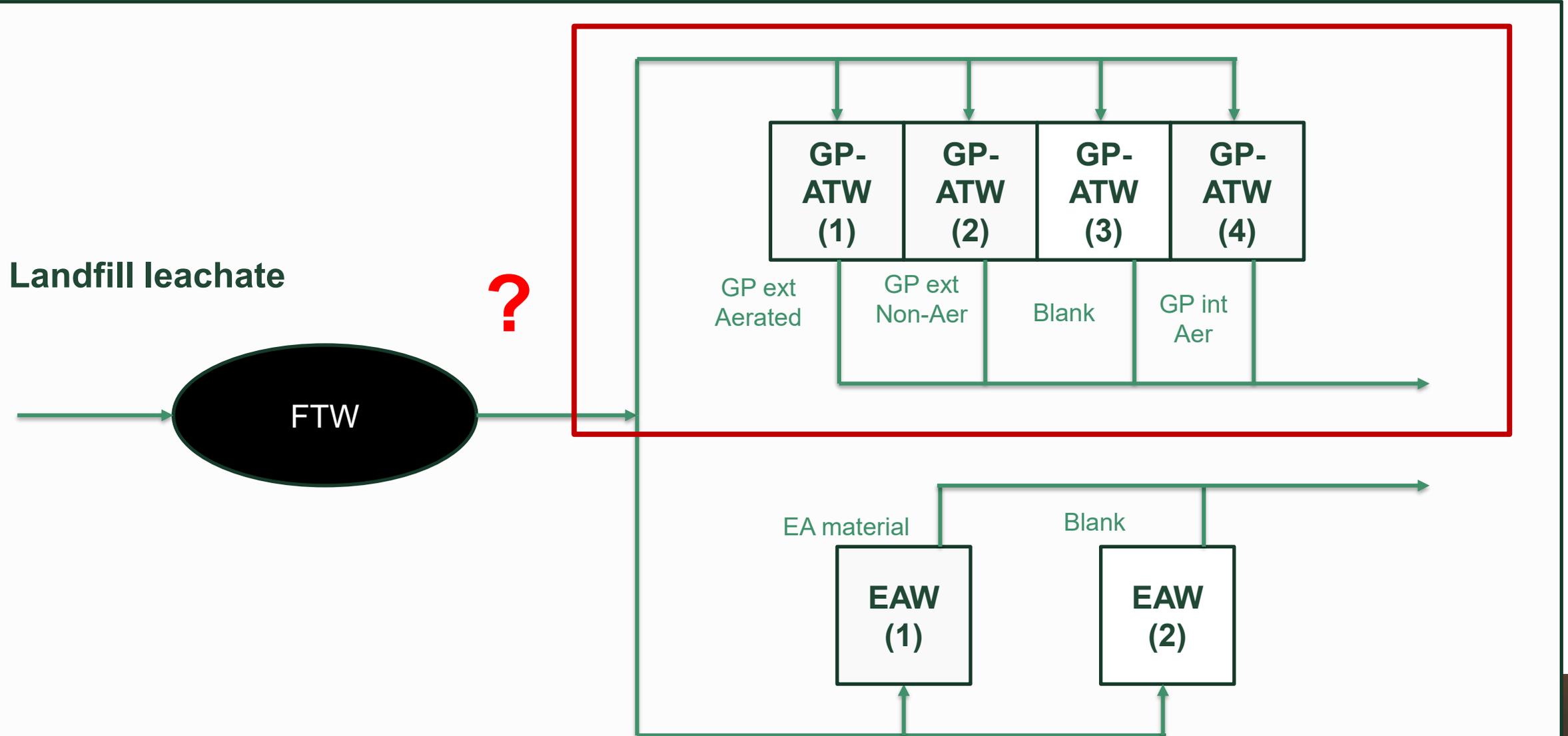


Geopolymer prototypes' construction

Boxes for GP placement



GP treatment – many setups



Next technical steps

- Finishing experimentation – currently ongoing
- FTW vs GP – ATW impact in the leachate wastewater treatment
- Analysing / evaluating the results for:
 - Assessing if aeration is (or not) needed – OPEX impact
 - Is better the internal or external GP configuration?
 - Life cycle analysis, life cost analysis and social impact



Commercialization and exploitation



- Business model:

1. Selling the reference of the technology
2. Selling the exploitation of the systems with long term contracts / tenders

- Product exploitation:

1. Identifying other facilities within Europe / World
2. Showing the reference long-term tested at XILOGA

- Potential partnerships:

1. European clusters of (industrial) waste managers
2. Venture capital risks to commercial promotion
3. Assistance to conference and sectorial fairs
4. Large companies to explore long term collaborations



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1st Innovation Workshop – Feedback & Discussion



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1st Innovation Workshop – Feedback & Discussion

We would now like to take the time to gather some initial feedback.

Please scan the QR code below to access the Q&A form online.

Scan the QR code below or enter code 2696 7806 to access our Mentimeter poll.

Responses will be recorded anonymously.



1st Innovation Workshop – Further steps

Feedback form

Following the completion of this 1st Innovation Workshop, we would like to gather your feedback. Feedback will be compiled into a feedback summary report, detailing the main perceptions of the Innovation Workshop and contributing towards the further development of GREEN ADAPT technologies as the project continues.

We will follow up this workshop with an email containing a link to access the feedback form online.

Responses will be recorded anonymously.

Other steps

Next innovation workshops





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Thank you

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