

IWA World Water Congress & Exhibition

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LIFE GREENADAPT - Nature Based Solutions For Climate Change Resilient Waste Infrastructures: A Focus On Landfill Leachate And Rainwater Run-off

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INTRO & ACKNOWLEDGMENTS



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Work area: Resilience of infrastructure, including application of blue-green infrastructure and ecosystem-based approaches to climate adaptation

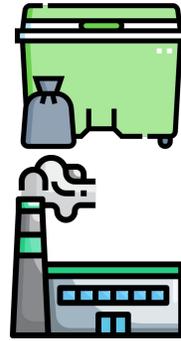


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CLIMATE CHANGE CONTEXT – Landfills

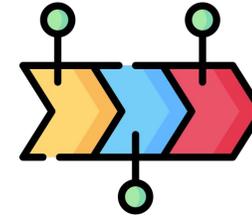


>500.000



80%

20%



140 years

EXTREME WEATHER EVENTS

ADVERSE EFFECTS

DROUGHTS

HEATWAVES



FIRES

HEAVY RAINS



INCREASE OF LEACHATES



LANDSLIDES



FLOODS



CLIMATE PROBLEM – Fires & Landslides



Delhi (India) – March-April 2022

Asunción (Paraguay) – July 2014

Extreme Temperature Heatwaves $T > 40^{\circ}\text{C}$
 Extreme rainfall Floods

Urban waste landfill

@rtve



Monávar (Alicante - Spain) – 26/07/2022

Zaldibar (Spain) – February 2020

Heatwaves $T > 30^{\circ}\text{C}$ overnight & Humidity $> 75\%$
 Extreme rainfall Landslide

Hazardous waste landfill

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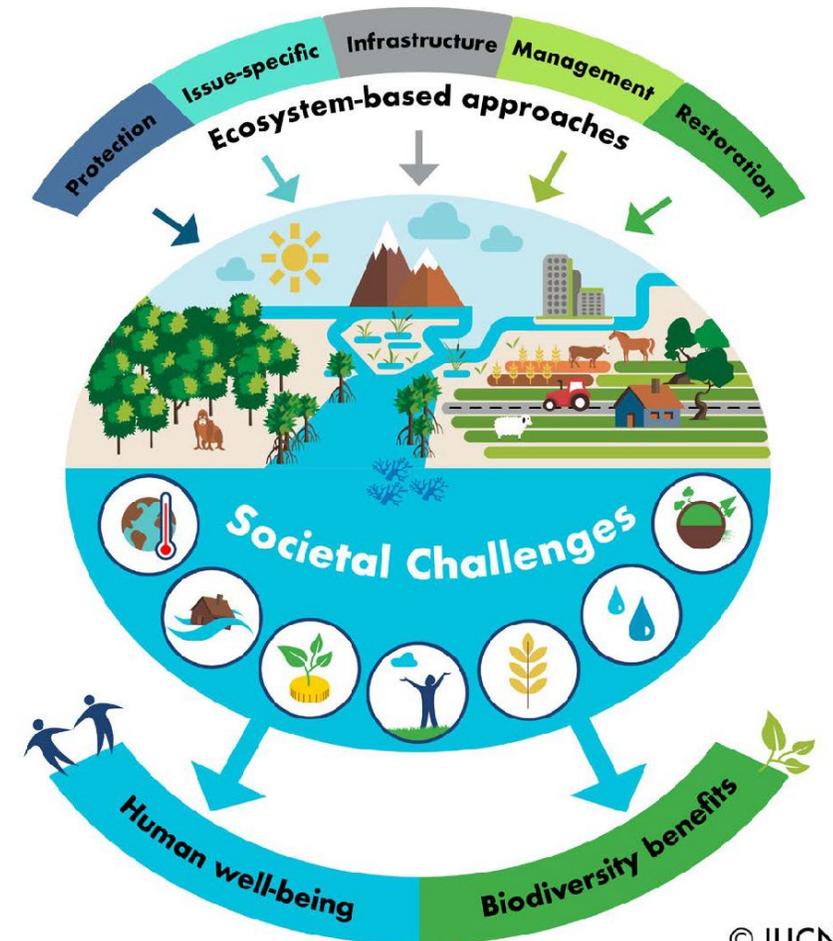
MAIN OBJECTIVE



LIFE GREEN
ADAPT

Green and Nature-Based Solutions for climate change-resilient waste infrastructure

LIFE GREEN ADAPT aims to **increase the resilience of EU waste infrastructures** (focused on landfills) against Climate Change by demonstrating **blue-green infrastructures (BGI) and ecosystem-based approaches potential**.



CASE STUDY – XILOGA LANDFILL (SPAIN)



XILOGA Landfill: Operational since 1999 (Industrial/Inert waste)

24,700 m³ of waste in cell 1 (closed March 2010)

58,000 m³ of waste in cell 2 (Restoration period)

RUN-OFF

Length: 50 m

Superior width: 16 m

Inferior width: 6 m

Depth: 4 m

Volume: 2200 m³



LEACHATE

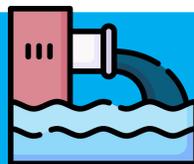
Length: 100 m

Superior width: 16 m

Inferior width: 6 m

Depth: 4 m

Volume: 4400 m³



Rainfall: **1,000 mm/year**

- 37% Dec–Feb
- 34% Sep–Nov
- 27% Mar–May

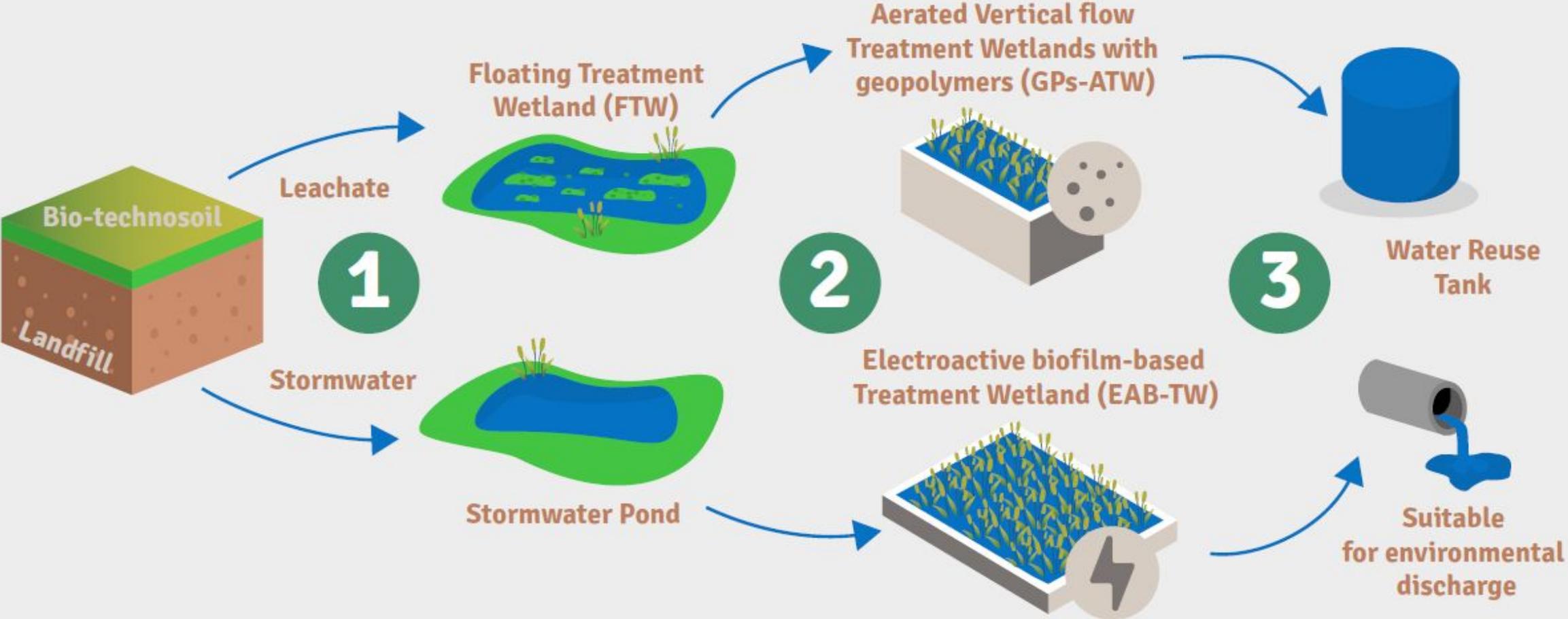


- Summer: Hot and dry (T 20°C – 30°C)
- Winter: T (10 °C)
- NW winds

Demonstration Site



CONCEPT (Blue & Green infrastructures)



SAMPLING CAMPAIGNS FOR TW DESIGN

- Sampling plan in the ponds for TW design (leachate and run-off)
- Representative samples:
 - 3 sampling points/pond
 - 2 composite samples/week
 - 3 weeks (Jan – Feb. 2022)
- Characterization parameters chosen according to discharge thresholds and historical data monthly analysis (2019-2021)
- Parameters analysis:
 - Organic matter and Nutrients
 - Other compounds: Ion, heavy metals, oils



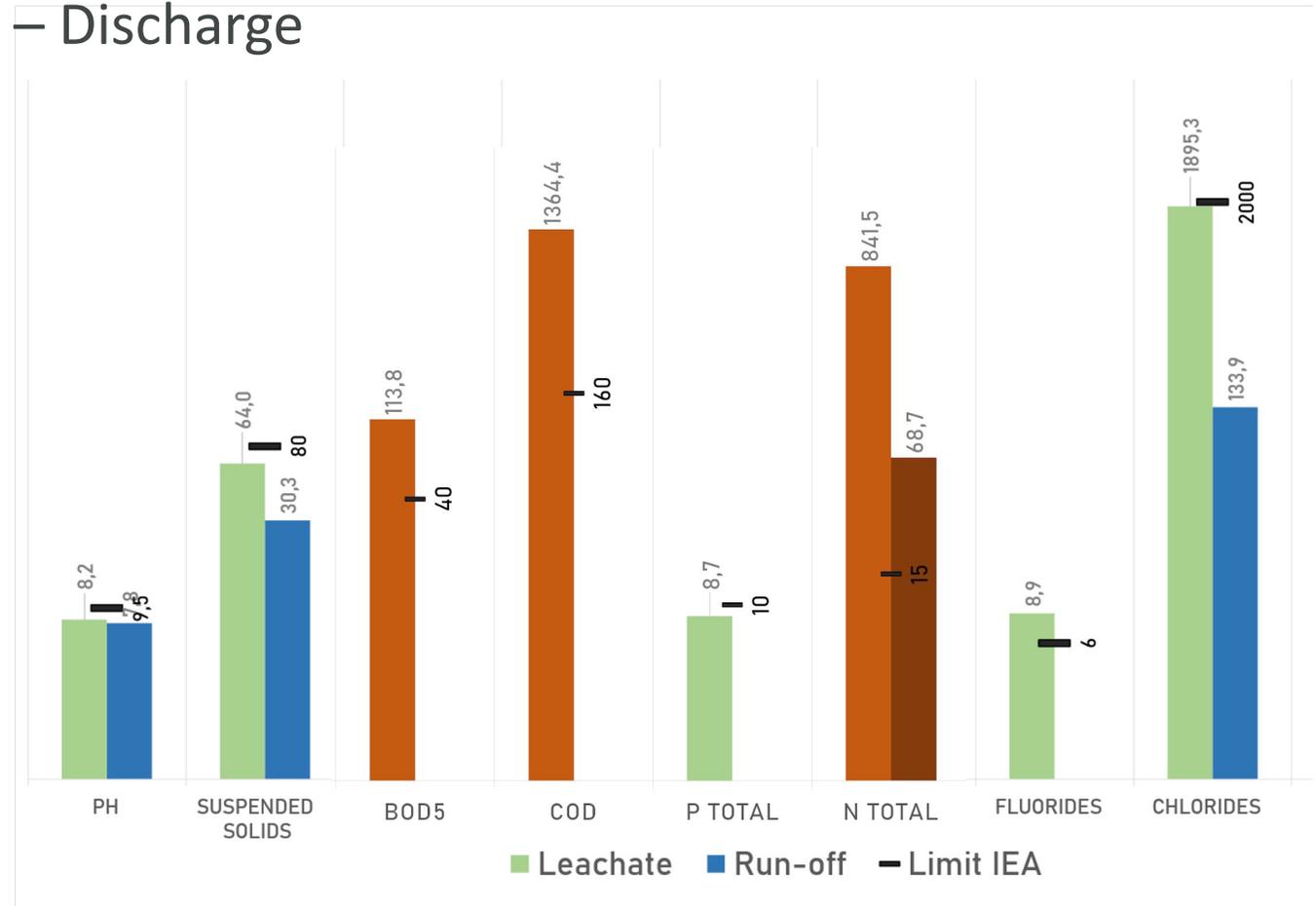
| Parameters Analysis | | | | | | |
|-------------------------------|-------------------------------|------------------------------|----------------|------------------|------------------------------|------------------------------|
| pH | EC | SS | Alkalinity | Hardness | COD | BOD ₅ |
| P _{total} | N _{total} | NH ₄ ⁺ | F ⁻ | Cl ⁻ | NO ₂ ⁻ | NO ₃ ⁻ |
| PO ₄ ³⁻ | SO ₄ ²⁻ | Na ⁺ | K ⁺ | Ca ²⁺ | Mg ²⁺ | Oil & FAT |
| Se | Fe | Al | | | | |



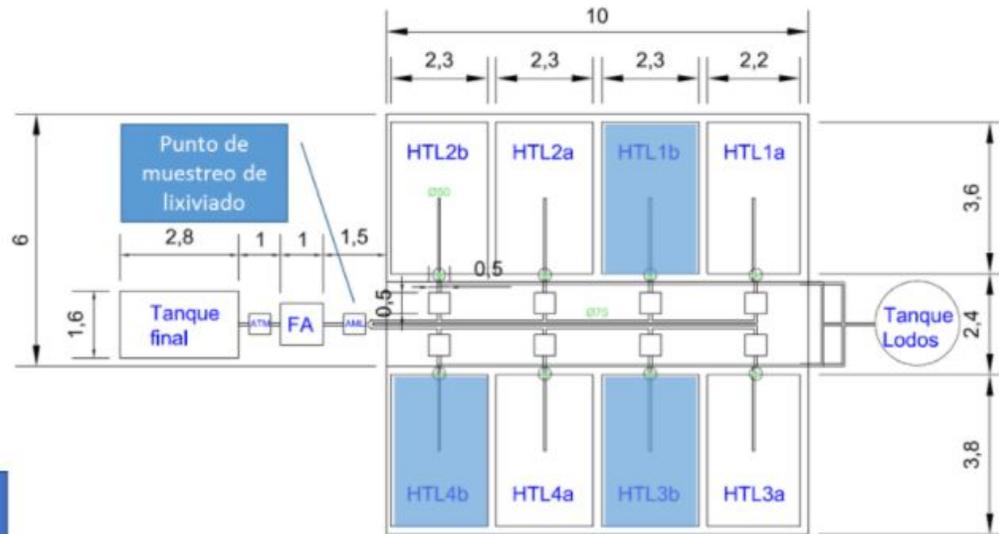
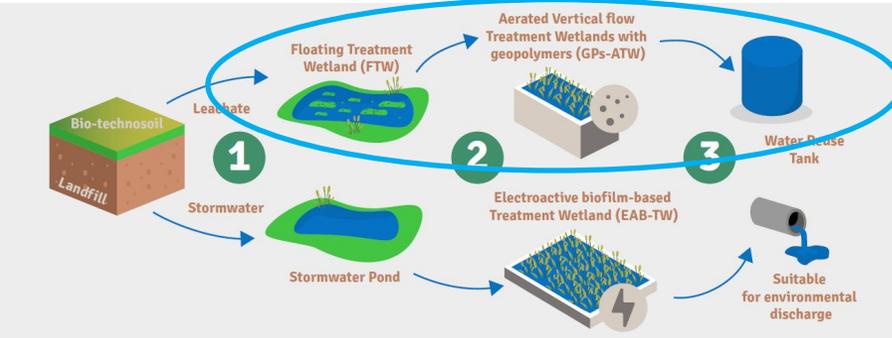
RESULTS OF SAMPLING CAMPAIGNS

Environmental Integrated Authorization – Discharge limits

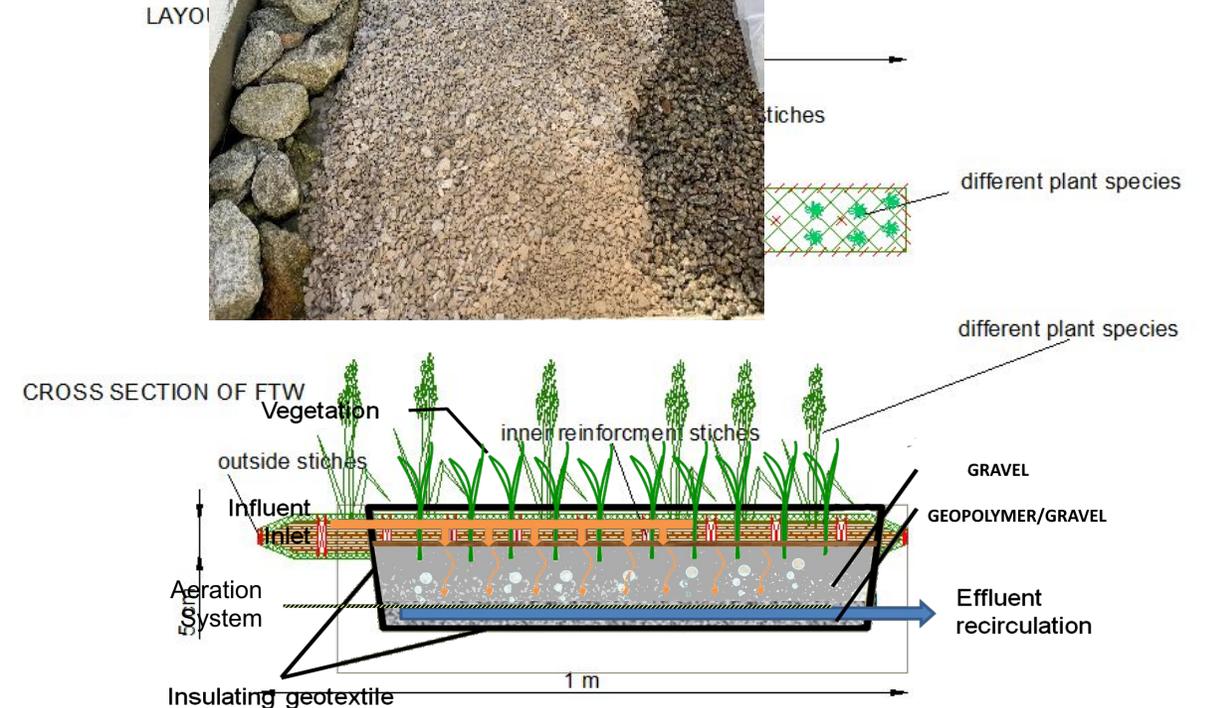
- EIA levels □ TW objective
 - Critical for design:
 - COD, BOD₅ (Leachate)
 - NTotal (Ammonia) (L & R-off)
 - Monitoring
 - Organic matter and nutrients
 - Chloride and Heavy Metals



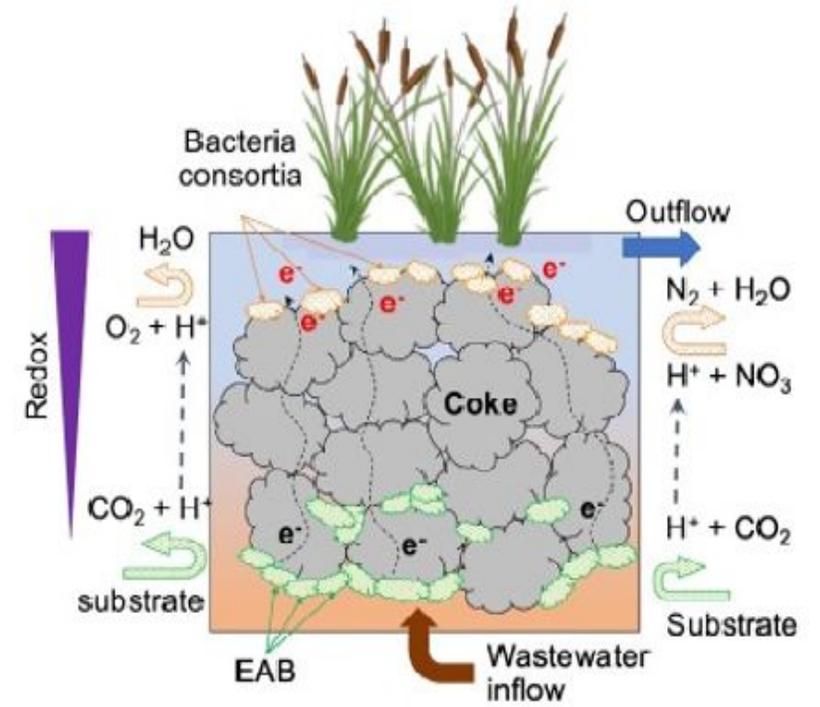
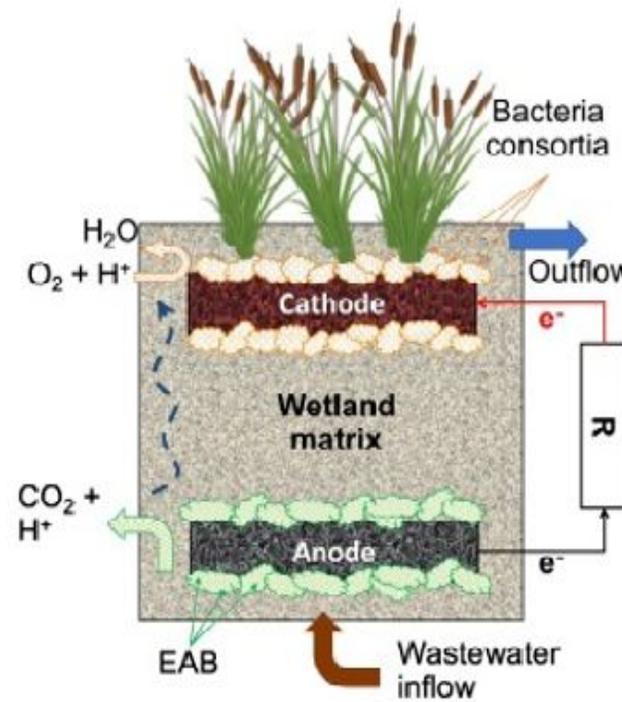
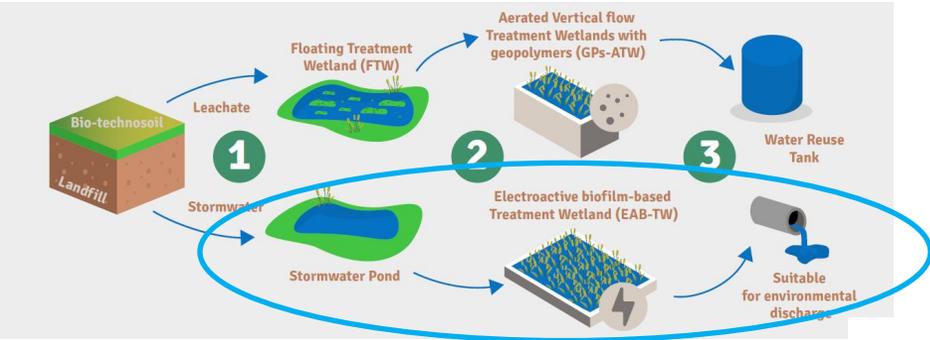
PRELIMINARY DESIGN OF FLOATING TW (Leachate) and AERATED TW



Leachate sampling point

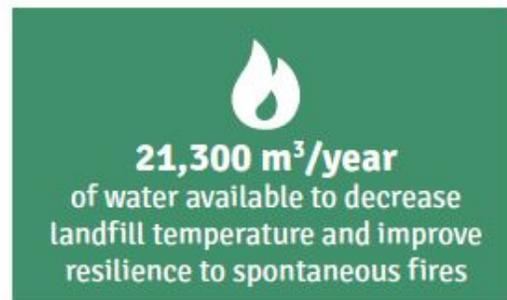
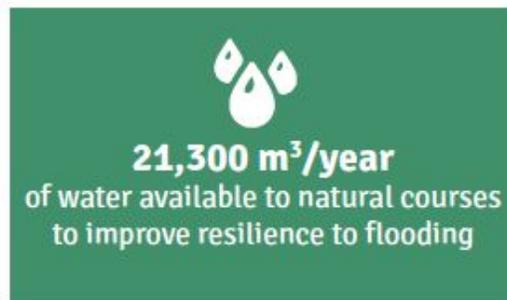


ELECTROACTIVE BIOFILM-BASED TW



CONCLUSIONS & MAIN OUTCOMES

- Preliminary design of treatment wetlands for run-off and leachate treatment has been performed
- Environmental regional permit is expected soon to start with the construction of de demo site



Thanks for your attention!

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AIMEN – Technology Centre