ZeroPM: Zero pollution of persistent, mobile substances

Sarah Hale, German Water Centre (TZW)
sarah.hale@tzw.de

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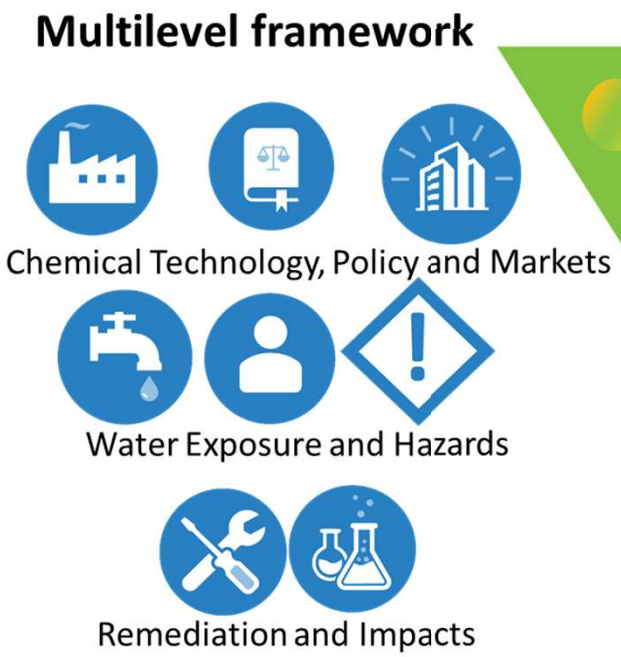
Zero pollution of persistent and mobile substances

- ZeroPM will interlink and synergize three strategies to protect the environment and human health from persistent, mobile substances: **Prevent**, **Prioritize** and **Remove**.



Project period:
October 2021 to September 2026
Project budget: 11.6 million Euro

ZeroPM's objectives

To establish an evidence-based multilevel framework for minimising use, emissions and pollution from PM substances to protect European water resources and avoid risks to humans.

- Subobjectives

PREVENT

▼ Provide safer chemical alternatives to non-essential uses of PM substances

▼ Stimulate and support policy changes to more effectively tackle PM substances

▼ Assist a market transition away from harmful PM substances

PRIORITIZE

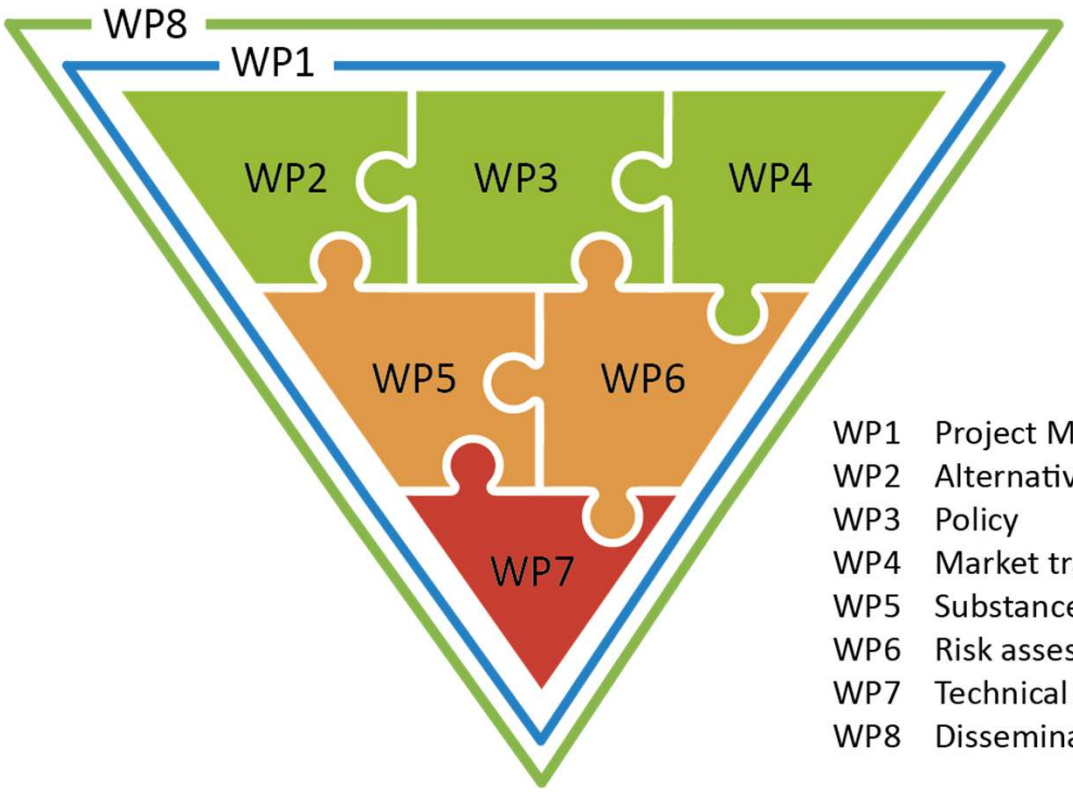
▼ Prioritize PM substances and substance groups on the global chemical market for prevention and removal

▼ Characterise and quantify impacts of PM substances on human health and the environment

REMOVE

▼ Demonstrate how and if legacy PM substance pollution can be remediated

ZeroPM's work packages



WP1 Project Management
WP2 Alternatives Assessment
WP3 Policy
WP4 Market transition
WP5 Substance grouping
WP6 Risk assessment
WP7 Technical solutions
WP8 Dissemination & Communication

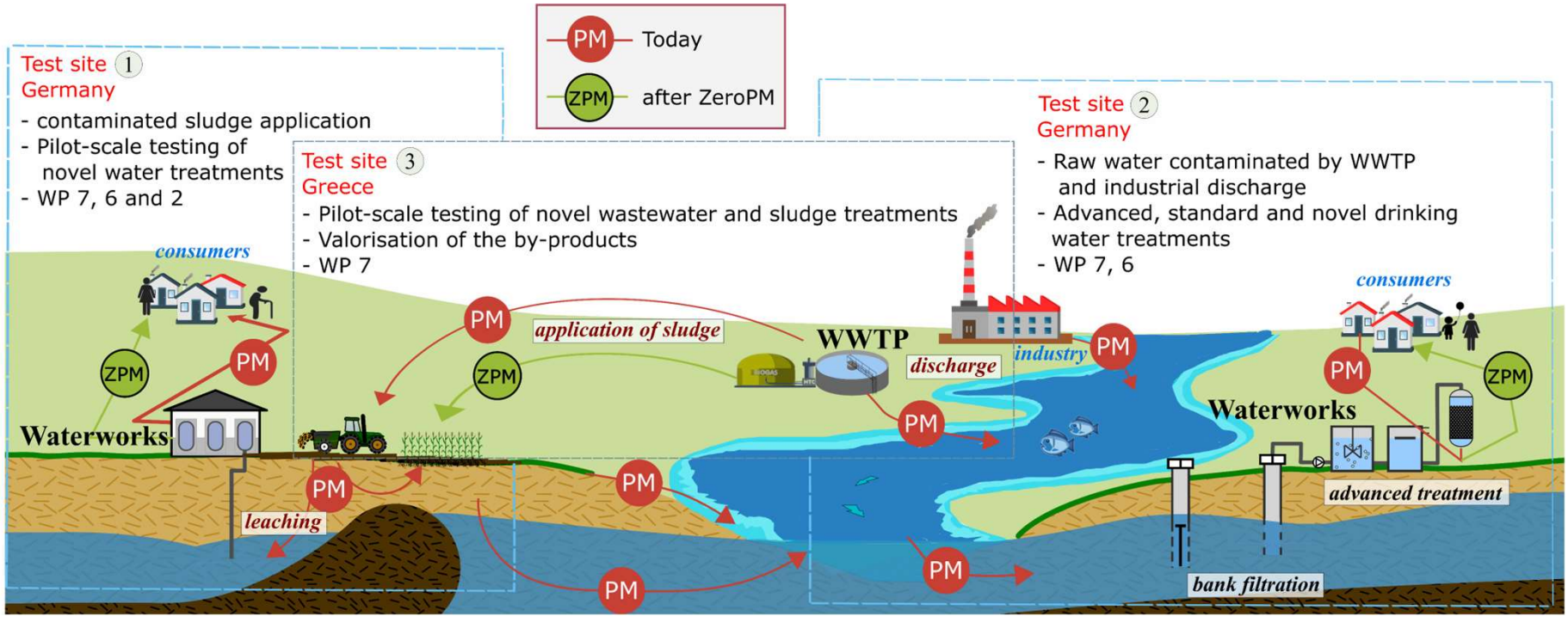
WP7 Technical Solutions

Objective: to demonstrate how and if legacy and prioritized PM substance pollution can be remediated

Sub objectives

- Improved analytical methods for PM substances and their degradation products
- Innovative water and sludge remediation solutions
- Comparison of the efficiency, cost and ecological impacts

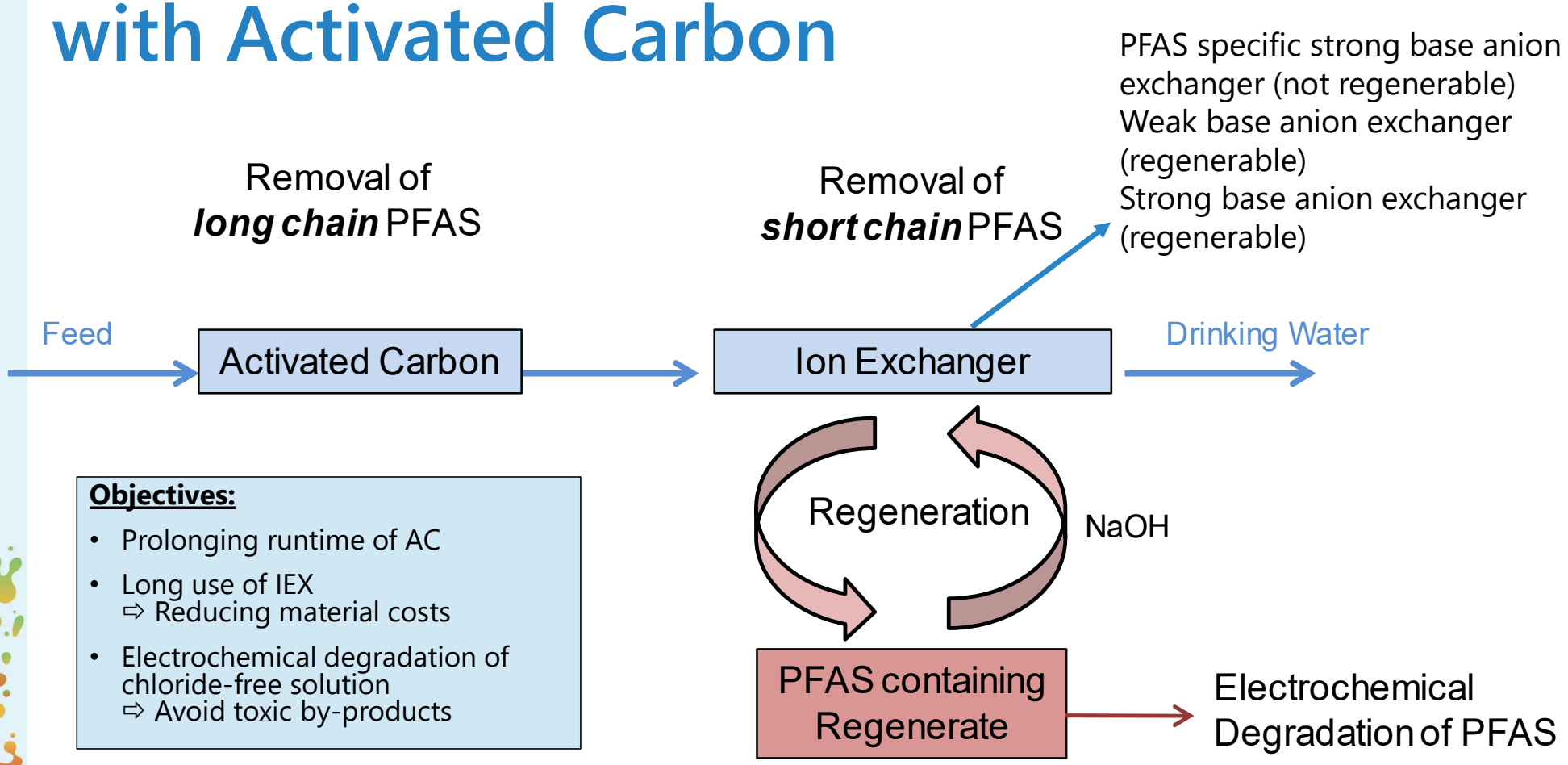
ZeroPM's test sites



Rastatt **Mytilene** **Upper Rhine**

Water treatment

Rastatt: Ion Exchanger in combination with Activated Carbon



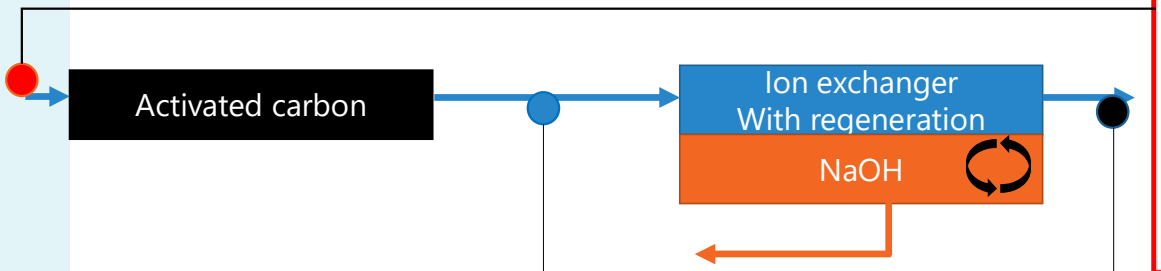
Objectives:

- Prolonging runtime of AC
- Long use of IEX
  ⇨ Reducing material costs
- Electrochemical degradation of chloride-free solution
  ⇨ Avoid toxic by-products

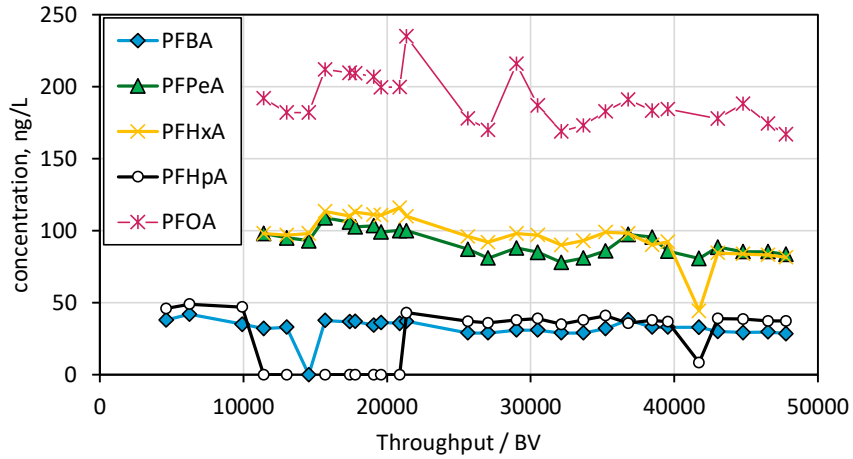
Test site 1: Rastatt

- City in South Germany
- 50,000 inhabitants
- Contaminated sludge applied
- Waterworks Rauental
- 250 m^3/h, 1.7 Mio. m^3/a
- 4 activated carbon (AC) filters à 18 m^3 for PFAS removal
- AC Change: every 17.000 BV / 6-9 month
- Pilot test of AC and IEX

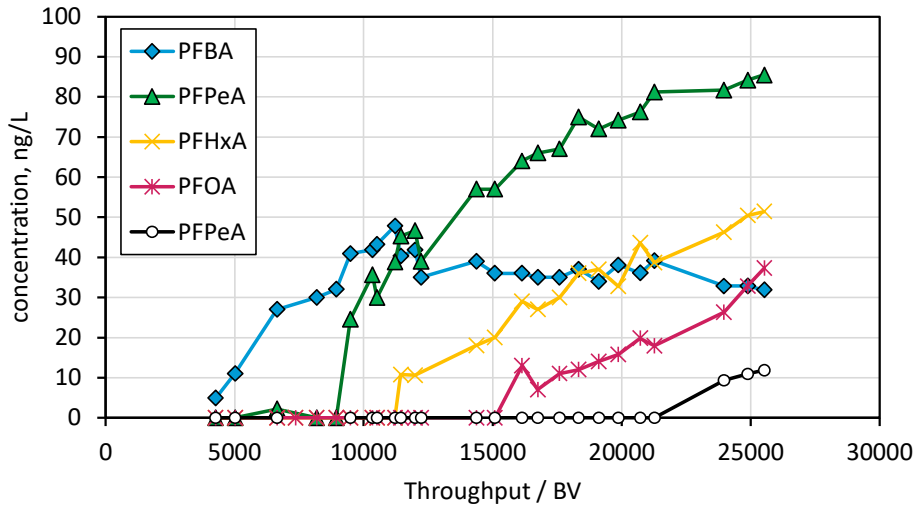
Treatment performance



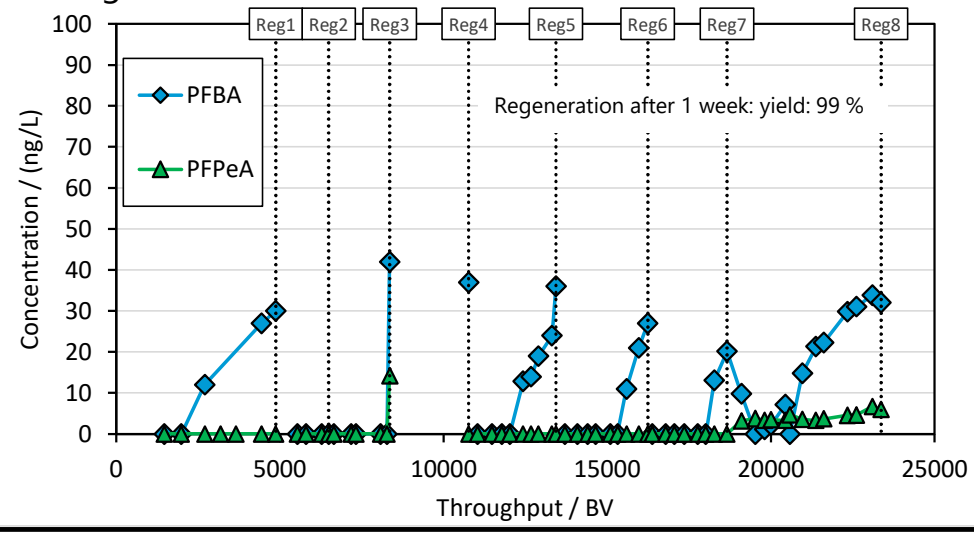
Raw water



After activated carbon



Drinking water:



Treatment material costs

	Activated carbon 1.2 € per Liter AC		Ion Exchanger 9 € per Liter IEX	
Substance of concern	**Operating time, BV**	**Cent/m³**	**Operating time, BV**	**Cent/m³**
PFBA	6,000	20	10,000	90
PFPeA	12,000	10	35,000	26
PFHxA	25,000	5	?	?

Operation time of 6,000 BV:

- Specific material costs: 20 Cent/m³
- 35 €/a for a 4 person household
- > 800,000 €/a for a water supplier (of 100,000 people)
- Specific remediation costs: 400,000 €/kg(PFAS)*

*c_0=0,5 µg/L

Sludge treatment

Technology 1: Modified Anaerobic Digestion (AD)

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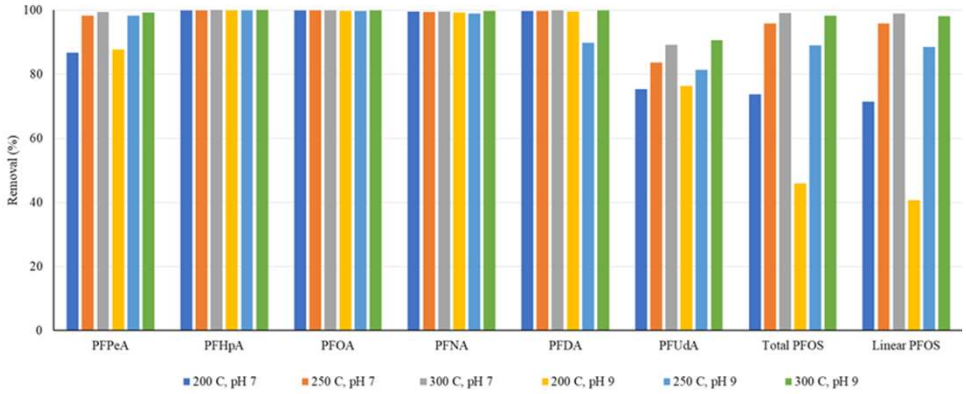
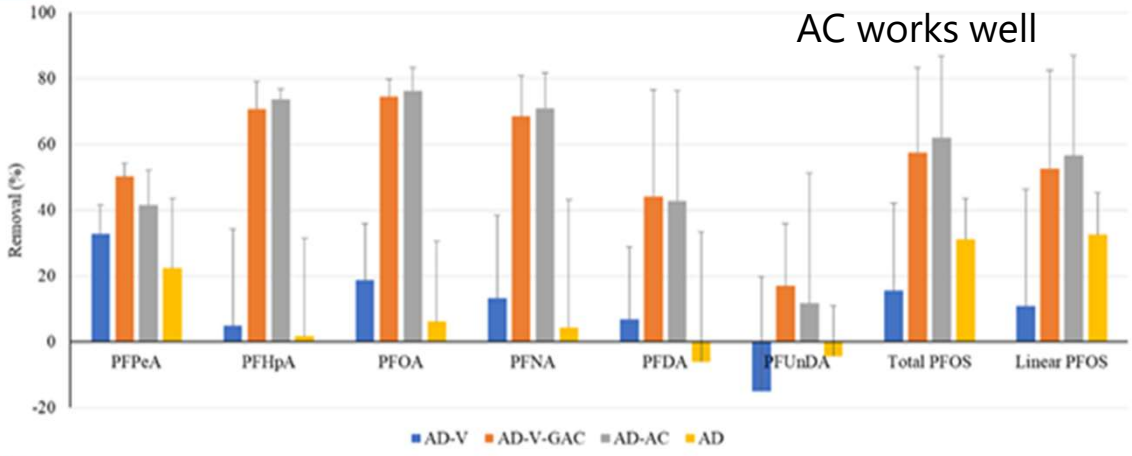
- Identifying the role of:
  - Sludge pretreatment (thermal, ultrasound)
  - Application of voltage (0.8 V, 2 V)
  - Addition of conductive materials (Granular Activated Carbon, graphite, magnetite, hydrochar)
  - Mesophilic (30-35 °C), Thermophilic (50-55 °C) conditions
  - PFAS and benzotriazoles (BTR)



AC works well



Technology 2: Hydrothermal Carbonization

- Increase of T=> improved PFAS removal

Dissemination and Communication

Website: https://zeropm.eu/

LinkedIn: ZeroPM

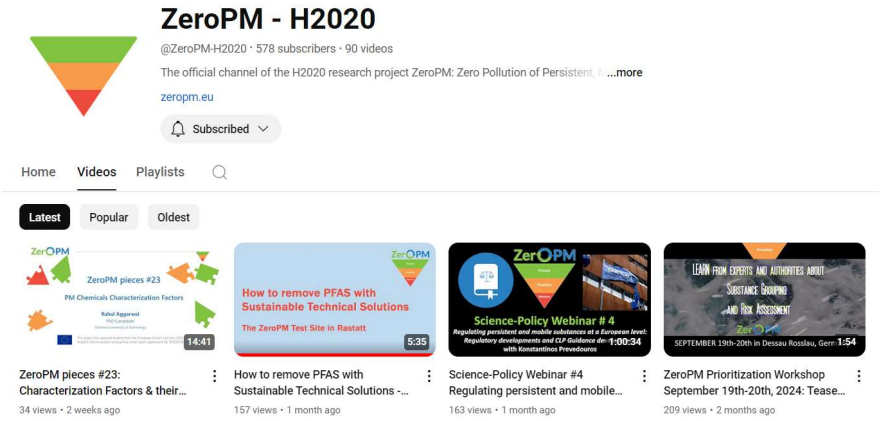
Youtube: @ZeroPM-H2020

Spotify & Apple: ZeroPM

Twitter/X: zeropm_h2020

Mastadon: @ZeroPM@mastadon.social

- Webinars
- Workshops
- Films and podcasts
- Factsheets and guidelines
- Summer schools
- Technology demonstrations



ZerOPM

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VU VRIJE UNIVERSITEIT AMSTERDAM

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