

PFAS

Perflourinated compounds

Phytoremediation with biochar And carbonbased Techniques to purify leachate



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NSR AB - Waste management

- Own by 6 municipalities
- 4 active or recently finally covered landfills
- Largest site: Filborna, Helsingborg start 1951
- No fire training location (PFOS and PFOA not predominating PFAS). **Shorter chain PFAS , fluorotelomers (6:2 FTS) and unknown precursors!**
- Outgoing water: 300 000 – 400 000 m³

PFAS11 at our landfills (ng/l)

Helsingborg (Filborna): 3500

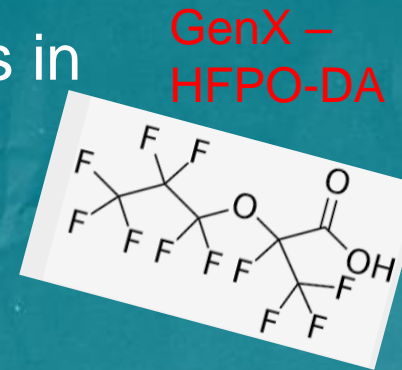
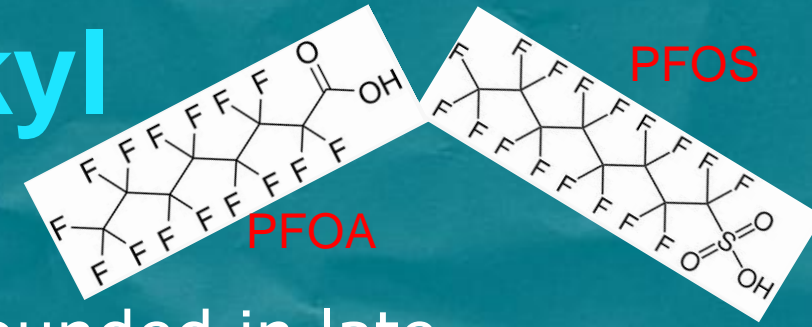
Båstad: 300

Åstorp: 500

Höganäs: 300

PFAS - Per- and polyfluoroalkyl substances

- Synthetic chemicals, widely used since 1970s (founded in late 1940s (AFFF, military use))
- USE: Stable under intense heat, have surfactant properties and function, e.g., as water and grease repellents.
- Carbon-fluorine bonds, which are one of the strongest chemical bonds in organic chemistry. PERSISTANT!
- Latest figure... over 9000 PFAS
- 11 or 33 substances in common analytical methods
- Long-chain PFAS ➡ shorter-chain PFAS (or with non-fluorinated substances).

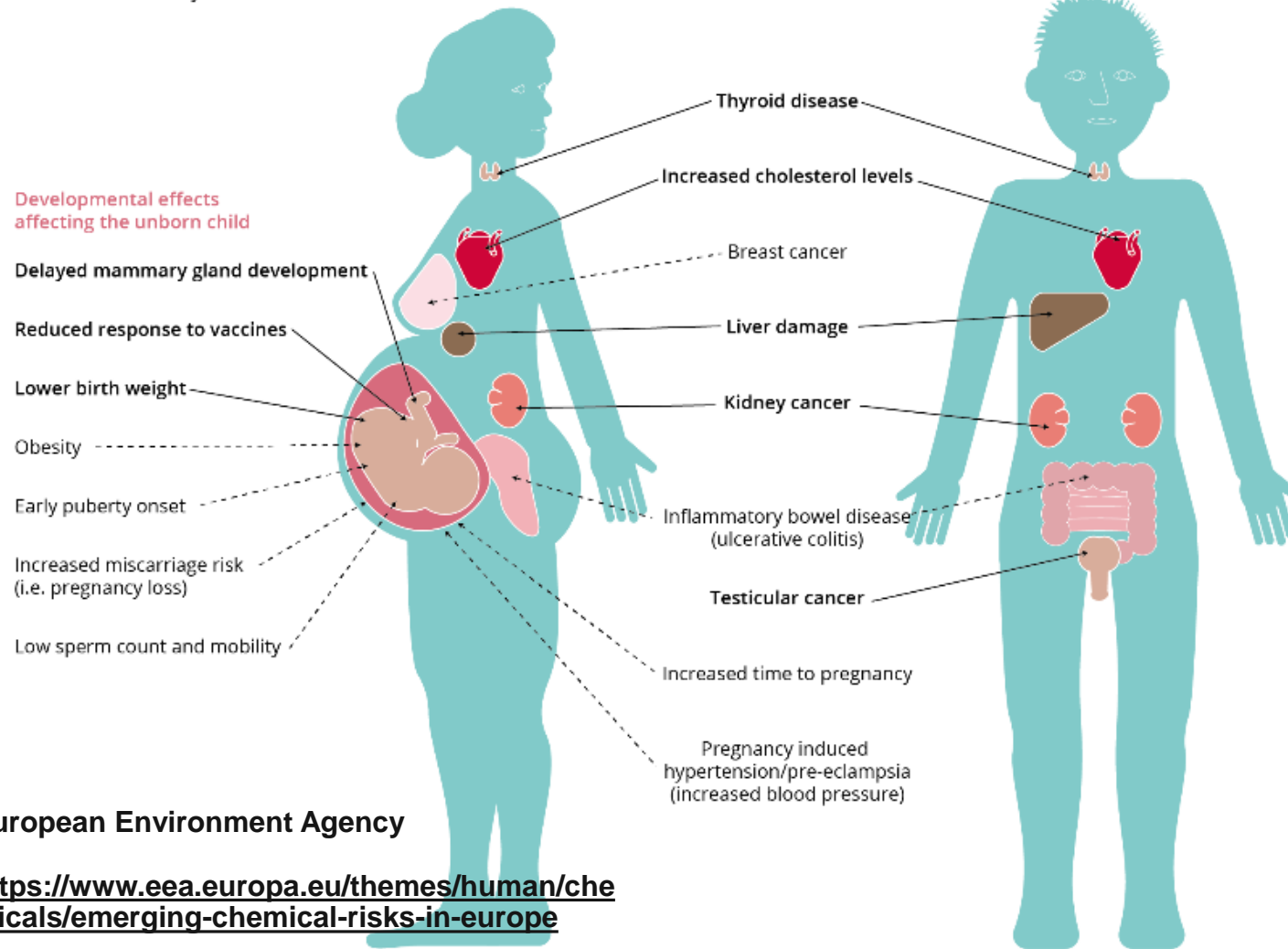


6:2 FTS



This is what it is about... ex PFAS effects on humans

— High certainty
- - - Lower certainty



European Environment Agency

<https://www.eea.europa.eu/themes/human/chemicals/emerging-chemical-risks-in-europe>

Ronneby site:
(Military practice field,
fire fighting foam in municipal
drinking water, high concentrations)

Proven impact

- Triglycerides and Cholesterol
- Reproductive hormone system and endometriosis

No proven impact

- Preeclampsia
- Inflammatory bowel disease
- Thyroid disease (women and men)

Ongoing studies

- Language development
- Vaccine response (Covid-19)

**Pilot
CARBON BASED
TECHNIQUES**

Market analysis
Procurement



TESTS

Line adjustments
More Tests



2018



2020



2021
Evaluation,
reporting



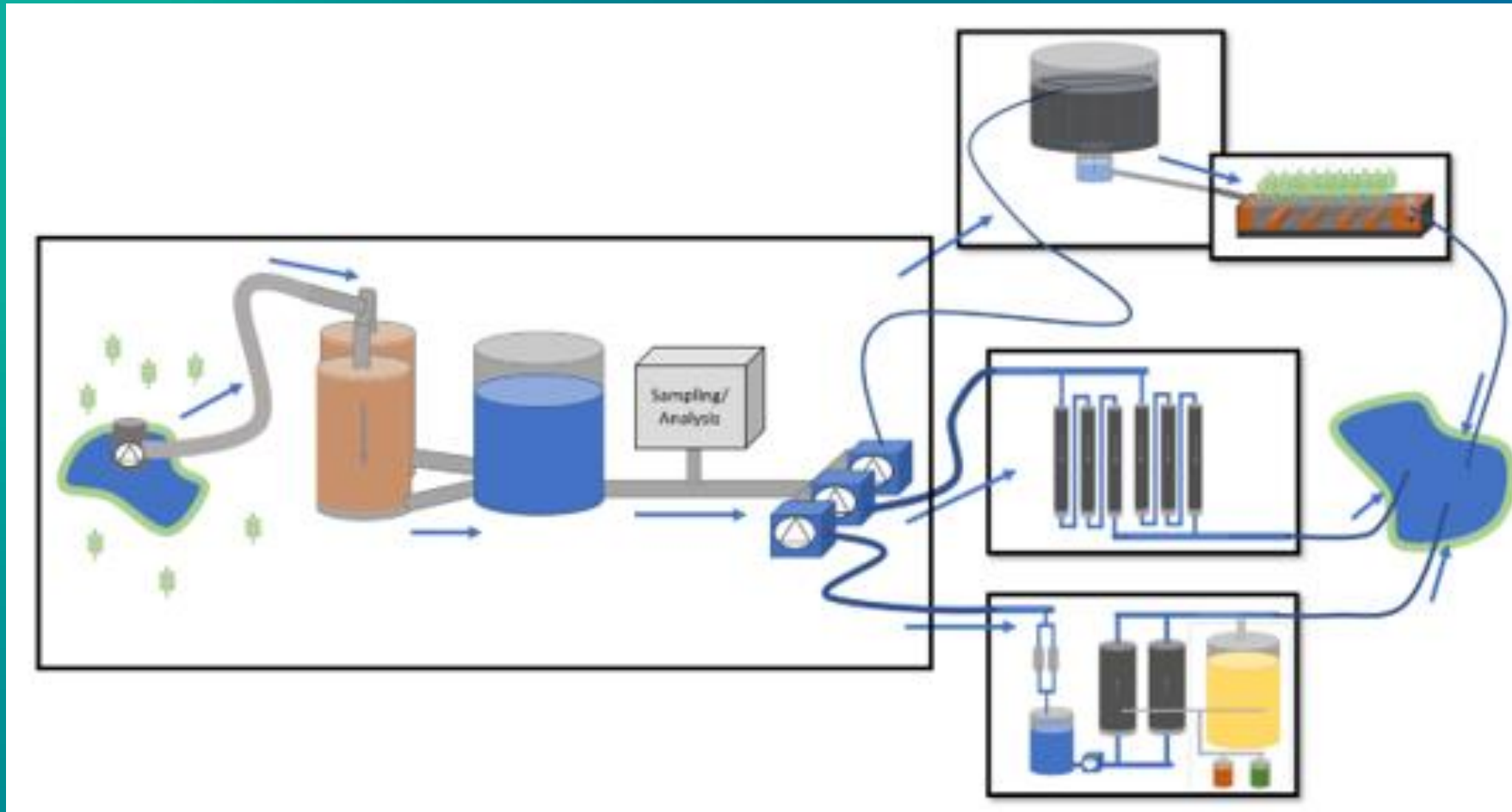
**PHYTOREMEDIATION
AND BIOCHAR**

Kvalitativ studie:
Salix
Literature review

Quantitative
study: Tests

MAIN PROJECT- PILOT

3 CARBONBASED METHODS TO PURIFY LEACHATE FROM PFAS



2020- the year of insight...

- The solution might be foaming...
- And maybe Phytoremediation

- Stratification in water
- PFAS in foam in aerated ponds

NEW
PROJECTS

RBR
PHYTO

SAFF
FROM
OPEC



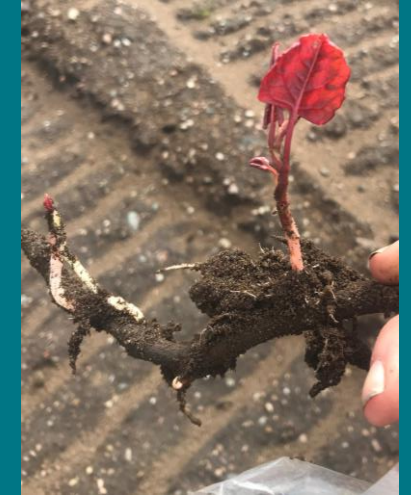


Biochar from woodchips at
700°C, 20 min processing time
30% Moisture

Choice of Crop

Plants present in plant screening areas

- *Phragmites australis*, Common Reed
- *Mischantus Giganteus*, "Elephantgrass"



Literature review and external analysis

- *Carex elata* "Bunkestarr", Sedges (possible hydroponic cultivation)
- *Glyceria maxima* "Jättegroe" Reed Sweet grass
- Bonus...
- Sunflower (tribute to Linnaeus university)
- Japanese knotweed (invasive, fast growing)

Reflection after RBR Phyto:

- Uptake of short chain PFCA (PFBA and PFPeA)
- Most promising (Carex Elata, Miscanthus and Salix)
- Ackumulation in plant important (time of harvest and sampling)
- Hard to compare Bioconcentration factors (BCF) between tests
- Not a significant difference with biochar (in our PFAS profile)
- Not the only solution, "a trimming step"?



Thank you for the attention!

Welcome to NSR!

