

Soil policy on PFAS in Flanders



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**Life Phoenix webinar ‘Impact of PFAS on
agricultural soil and plants’ – 10 March 2021**

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How to deal with the **legacy** of PFAS in the soil-water system?

Content

Introduction – setting the scene

Prelude – How did we get started?

1. **Guidelines** – When to measure PFAS?
2. **Threshold values** PFOS/PFOA: soil remediation standards/
background values/criteria for use of excavated soil
3. How to deal with **different PFAS**?

Outlook towards the future & research needs

Coda – international collaboration – EmConSoil network

Introduction – setting the scene

Flemish Soil Decree & Implementation order VLAREBO

▶ **Obligation to soil investigation** on land with **risk activities**, periodically & upon transfer

- When contaminated, remediation is needed
- By **operator** or **owner**, according the '*polluter pays*' - principle
- Guidelines - all **suspected substances** need be analyzed

▶ Regulation on **excavated soil**



- Guidelines – when, how to sample, which substances to analyze, ... for a technical report

⇒ focus on **well-known contaminants**:
heavy metals, mineral oil, BTEX, cVOC and PAH

← **PFAS**
Questions:
analysis?
which method?
threshold values?

Prelude – How did we get started?



⇒ Exploratory measuring campaign on PFAS (2016)

Inventory of risk activities

24 sites were selected using OVAM-database and other information

fire fighting training grounds / fire incidents
textile industry / paper industry / paint industry / galvanic industry
water treatment plant
waste dump

Soil and groundwater were analyzed for 21 PFASs

Conclusions:

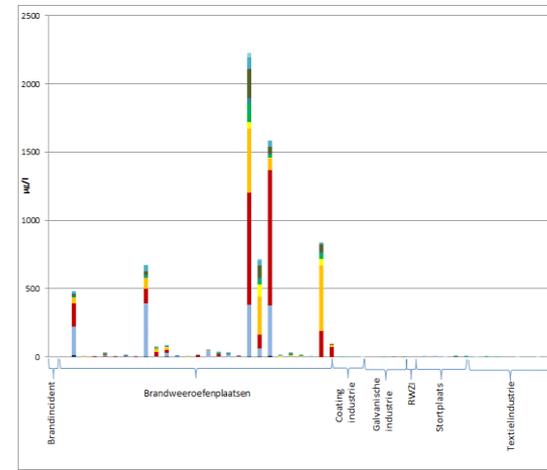
conc in soil: 0 – 9000 $\mu\text{g}/\text{kg dw}$ \sum PFAS

conc in groundwater: 0 – 2000 $\mu\text{g}/\text{L}$ \sum PFAS

Highest conc on **fire fighting training grounds**

→ PFOS, PFOA, PFHxA, PFHxS, PFNA, PFDA, 6:2 FTS

[www](#): 'PFAS in soil and groundwater around risk activities in Flanders'



1 Guidelines – When to measure PFAS?



Guidelines on PFAS

▶ When is PFAS a 'suspected' substance?

- Soil investigation
- Technical report

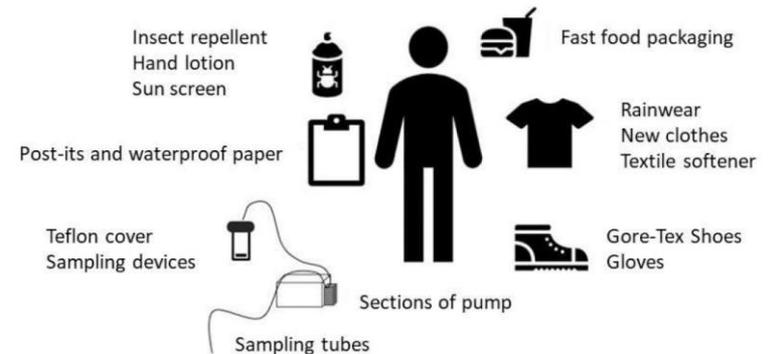
▶ List of risk activities - high/limited risk for PFAS contamination of soil & groundwater

High risk:

- PFAS production sites
- PFAS processing industry (galvanic industry)
- Sites where fire fighting foam was used (fire incidents & fire fighting training grounds)

- include PFAS when soil investigation is needed
- Include PFAS in technical report on excavated soil

▶ Checklist for sampling



▶ Analytical method: CMA/3/D

→ LC – MS/MS

▶ Starting date: 1/9/2020

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Setting soil standards for PFOS and PFOA

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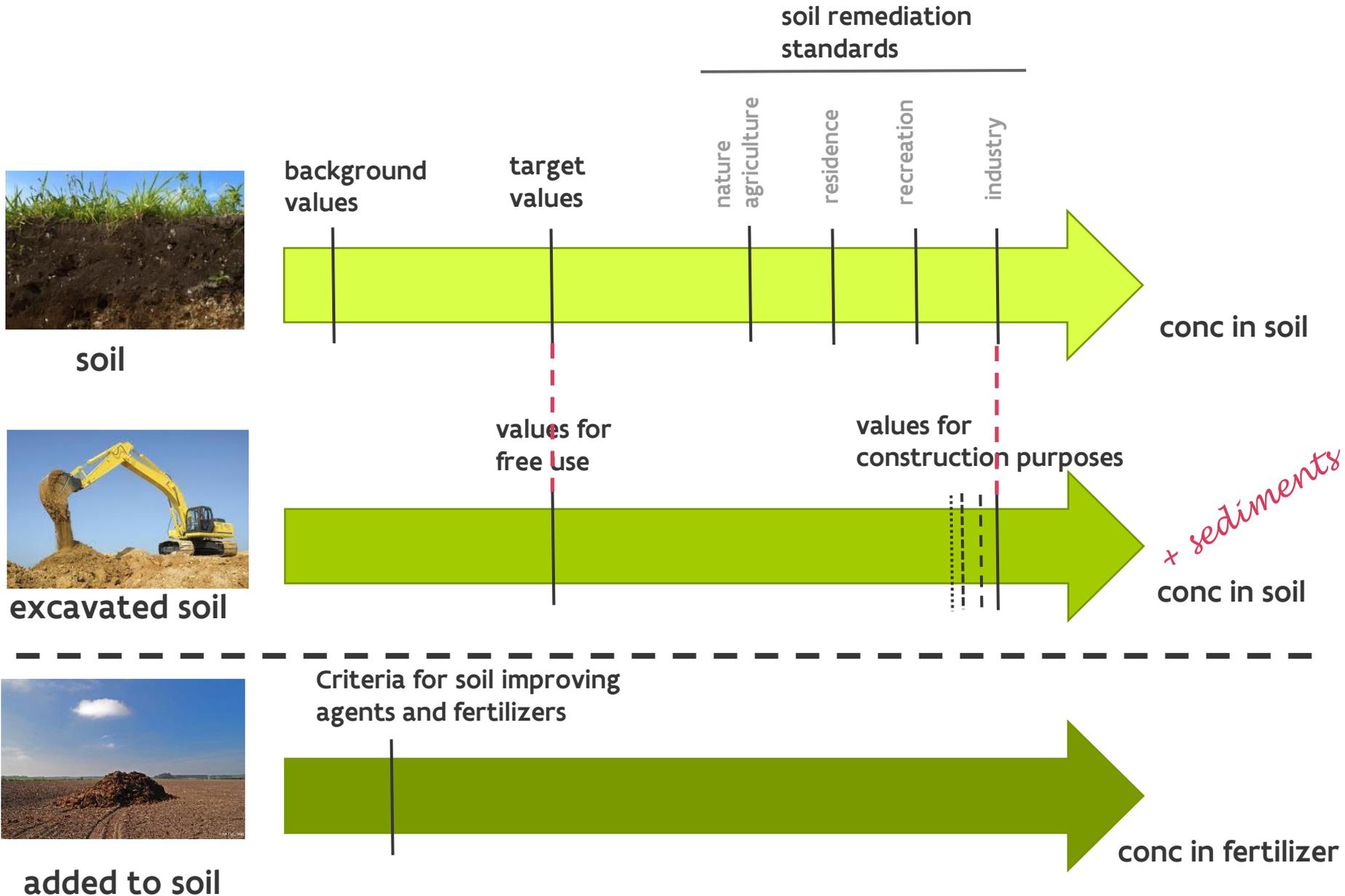
Without standards,
there can be no
improvement.

Taiichi Ohno



”

Overview of soil thresholds used in Flanders



Development of soil criteria for PFAS

General rule: for parameters without standards in regulations:

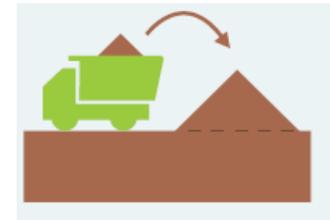
→ **criteria** are proposed by accredited soil experts

Criteria for excavated soil: most urgent

provisional criteria : for free use of excavated soil
for construction purposes

→ responsibility of soil expert

more details in guidelines



Soil remediation criteria are derived by VITO, for **PFOS** & **PFOA**

human tox: using transfer & exposure model [S-Risk](#)

ecotox : same values used as RIVM (NL)

[Proposal_SRV_PFOS_PFOA.pdf](#)

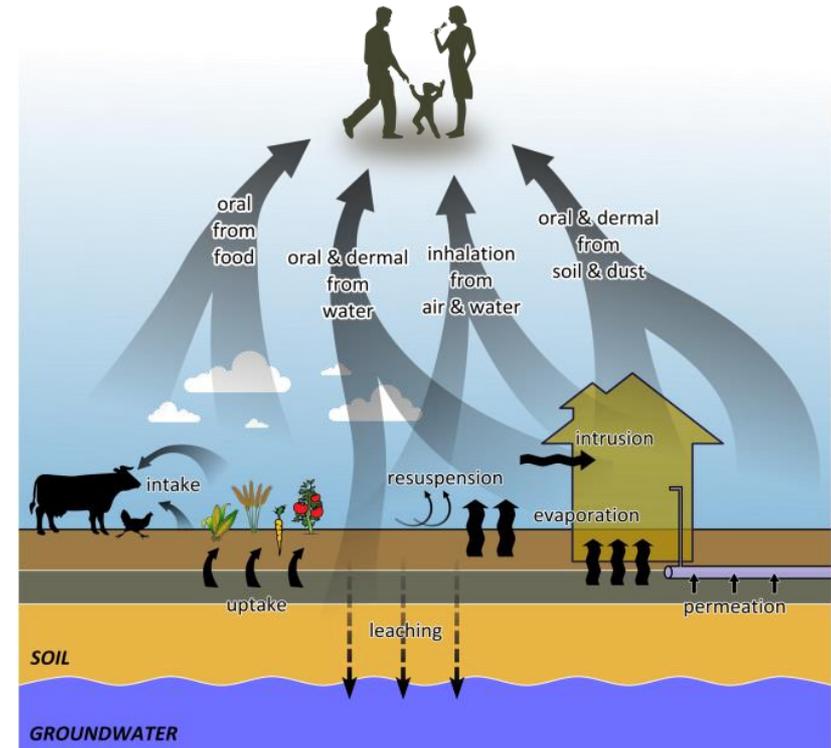


Transfer & exposure model S-Risk



Uptake of PFOS & PFOA by plants: taken into account for 'agriculture' and 'residence'

→ BCF from literature



Soil remediation criteria for PFOS

PFOS	Land use type	I/II nature / agriculture	III residence	IV recreation	V industry
	Human tox (µg/kg dm)	3,1	205	1.949	1.949
	Ecotox (µg/kg dm)	3	18	110	9.100
	Soil remediation value (µg/kg dm)	--	18	110	1.949
	Soil remediation value for groundwater	120 ng/L			

- ▶ Is there a background concentration for PFAS in soil? (e.g. Vedagiri et al. 2018)
- ▶ Based on TDI of 20 ng/kg bw/day (US-EPA, 2016)
- ▶ Soil remediation value groundwater ≈ EU quality standard DW (0,1 µg/L)

$$SRV_{gw} = \frac{TDI \times RF \times \text{body weight}}{Q}$$

Soil remediation criteria for PFOA

PFOA	Land use type	I/II nature / agriculture	III residence	IV recreation	V industry
	Human tox ($\mu\text{g}/\text{kg dm}$)	4,3	205	643	643
	Ecotox ($\mu\text{g}/\text{kg dm}$)	7	89	1.100	50.000
	Soil remediation value ($\mu\text{g}/\text{kg dm}$)	--	89	643	643
	Soil remediation value for groundwater	120 ng/L			

- ▶ Based on TDI of 20 ng/kg bw/day (US-EPA, 2016)
- ▶ Leaching to groundwater is not taken into account (→ separately in Flemish methodology)
- ▶ **Provisional** criteria, in guidelines, not in implementation order

Background values for PFAS in soil

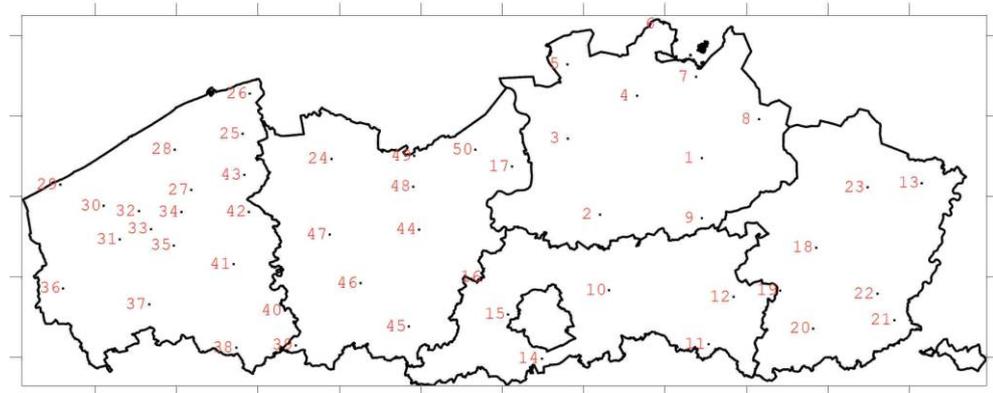


Study commissioned to VITO

50 'unsuspected' sites selected
top layer (0-20cm)
40 PFAS analyzed

⇒ PFOS, PFOA and PFBA
found in almost all samples
background values derived
= 90-percentile

⇒ 6:2 FTS found in 27 of 50 samples



	Average ($\mu\text{g}/\text{kg dm}$)	Background values ($\mu\text{g}/\text{kg dm}$)	Quantification limit ($\mu\text{g}/\text{kg dm}$)
PFOS	0,78	1,50	0,2
PFOA	0,56	0,96	0,2
PFBA	0,76	1,25	0,2

[weblink to study \(Dutch\)](#)

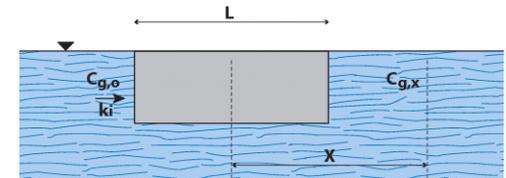
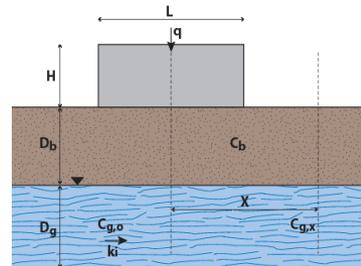
Compared to values found in the Netherlands (P95)
PFOS = 1,4 $\mu\text{g}/\text{kg dm}$ PFOA = 1,9 $\mu\text{g}/\text{kg dm}$

Criteria for the use of excavated soil

free use of excavated soil – criterium for the use in construction purposes

➤ Methodology

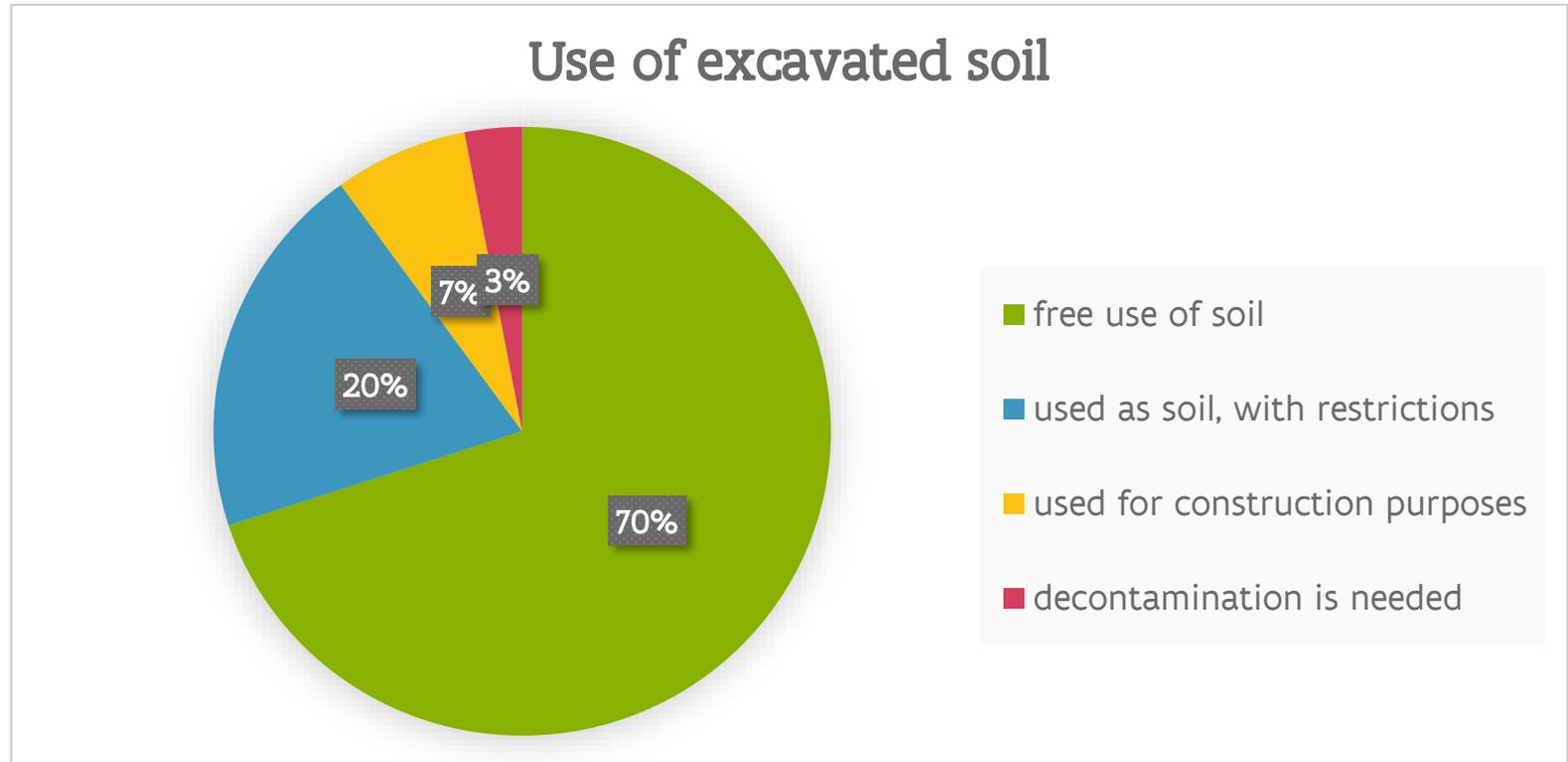
- leaching: different scenario's
calculate LV1 / LV2 / LV3
- + boundary conditions:
>background, <SRV



➤ Values

Parameter ($\mu\text{g}/\text{kg dm}$)	Quantification limit	LV1	LV2	LV3	Background values	Value for free use	Soil remediation value I/II	Soil remediation value III
PFOS	0,2	0,05	0,2	0,4	1,5	?	3?	18
PFOA	0,2	0,02	0,1	0,2	1,0	?	4,3?	89

How excavated soil is used in Flanders?



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**How to deal
with different
PFAS?**

How to deal with different PFAS?

- ▶ Soil criteria for PFOS & PFOA
- ▶ Standardized analytical methods: data on 30 – 40 PFASs

⇒ a pragmatic approach is needed

Possible ways:

- ▶ Relative potency factors (RIVM, 2018)
exposure to mixture of PFAS expressed as comparable amount of PFOA
in practical guidelines: PFAS/PFOA or PFAS/PFOS, with value for PFAS
applying to every substance without adding up
- ▶ \sum PFCA and \sum PFSA – proposal by VITO
based on substance properties
in practice ?

Outlook towards the future & Research needs



Outlook towards the future / Research needs

Research needs:

- ▶ Leaching?
- ▶ Uptake in food products?
- ▶ Other PFAS?
- ▶ Combined effects?

- ▶ Relative importance of exposure routes?

Research project started in 2020

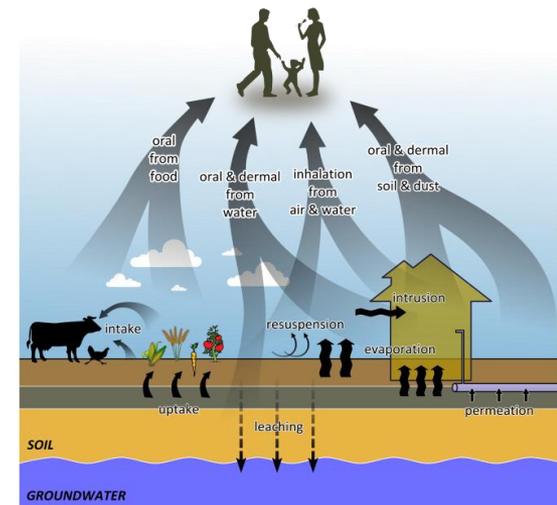
in collaboration with the Department for the Environment
(Environment & Health)

How are people **exposed** to PFAS? Main exposure routes?
e.g. (local) food, water, house dust, soil, ...

combined with **biomonitoring** data

part of [Flemish PFAS action plan](#)

- ▶ Inventory of fire fighting training grounds



Coda

International collaboration – network **EmConSoil**

Focus: on **legacy** of emerging soil contaminants

Stakeholders from industry, research, policy, consultancy & civil society

Aims of the network:

- exchange and dissemination of knowledge, data, technical & juridical experience
- developing strategies and policies through **co-creation**
- raising awareness among stakeholders
- enabling **international** and **intersectoral** collaboration

Please, join the network

Go to:

www.ovamenglish.be/emconsoil



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Save the date
May 6 & 7th, 2021

ENSOr

3rd International workshop on Emerging policy challenges on New SOil contaminants (ENSOr)

Online event
www.2mpact.be/ensor2021/

DEADLINE ABSTRACTS
31 January 2021

**Thank you for
your attention !**

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