Prof. Dr. Greet Schoeters

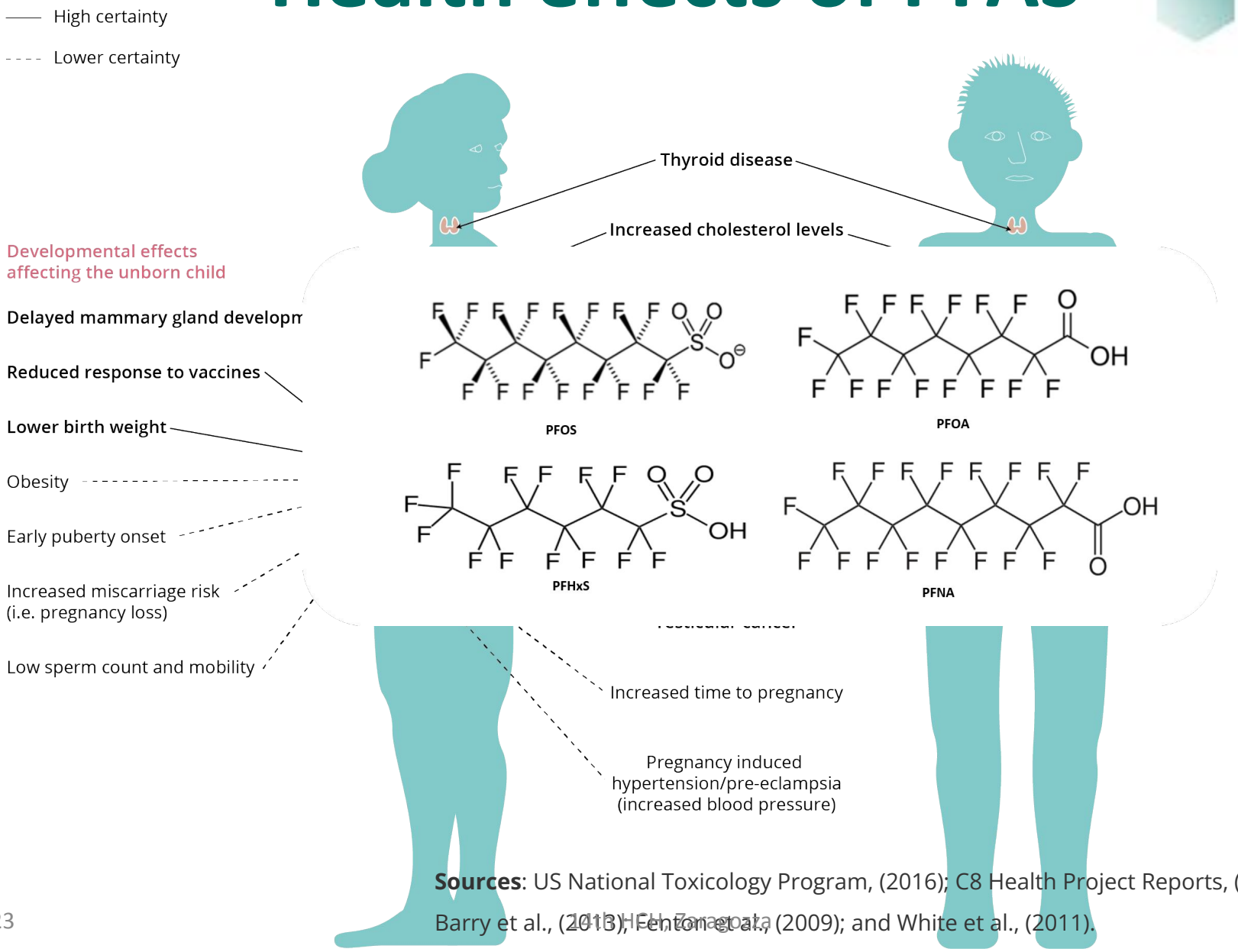
University of Antwerp

The Belgian 3M case from a health perspective

G. Schoeters, A. Colles*

University of Antwerp, * VITO

Health effects of PFAS

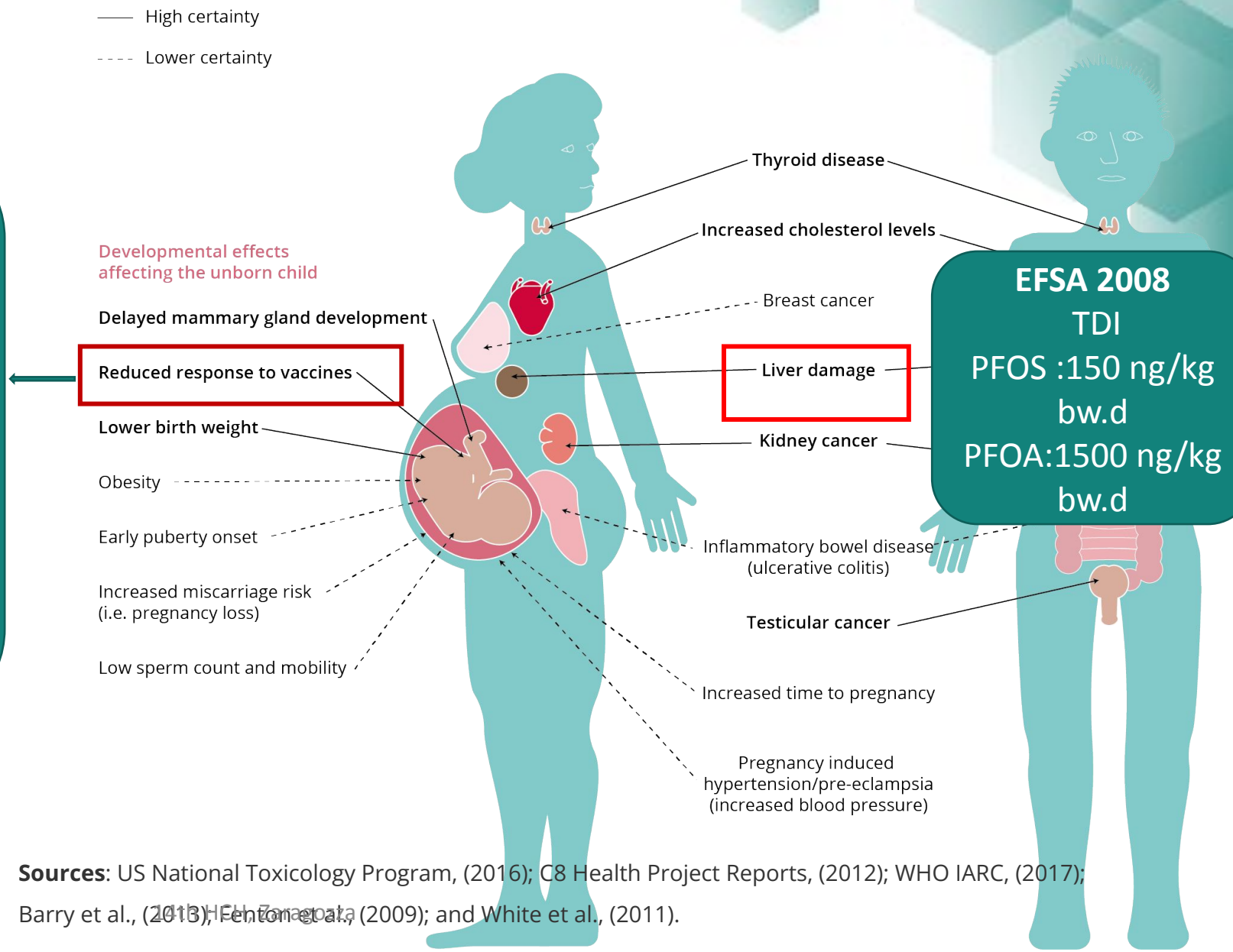


Sources: US National Toxicology Program, (2016); C8 Health Project Reports, (2012); WHO IARC, (2017); Barry et al., (2013); Fenton et al., (2009); and White et al., (2011).

Health effects of PFAS

EFSA 2020
PFOA+PFOS+ PFNA (C9) +PFHxS (C6)

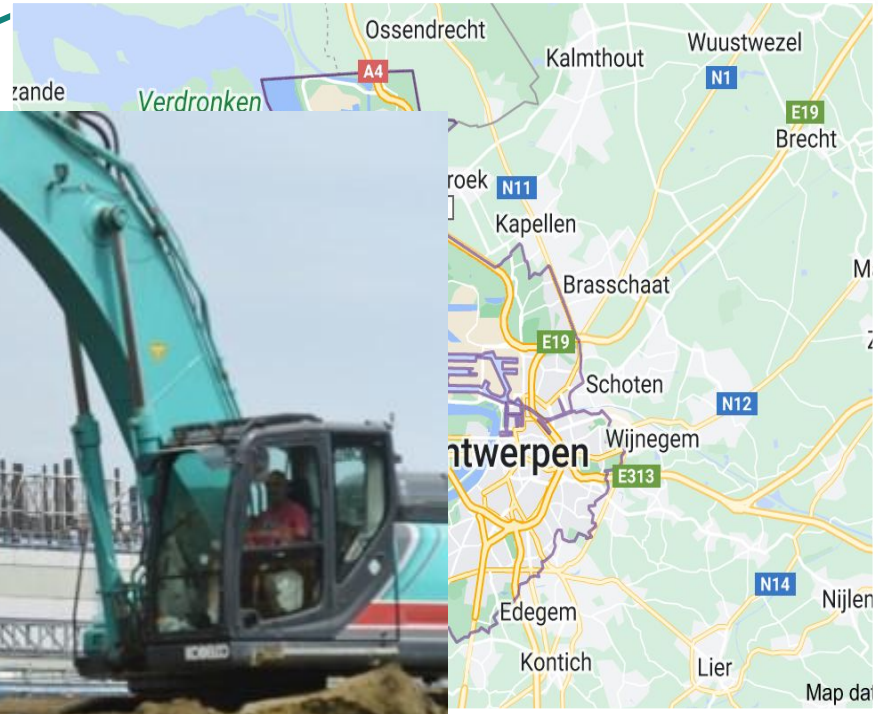
Tolerable Weekly Intake (TWI):
4.4 ng/kg body weight per week
↕
6.9 µg/L serum
(human biomonitoring guidance value)

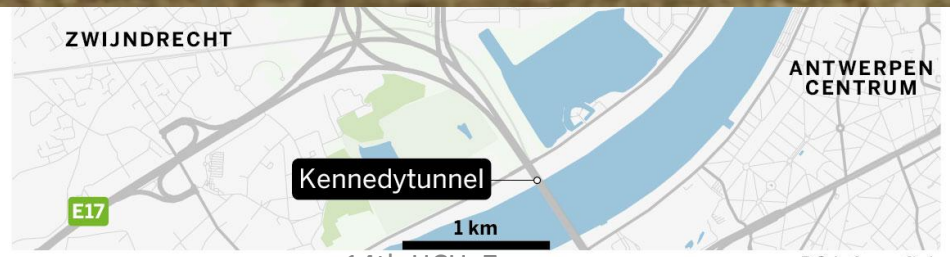


EFSA 2008
TDI
PFOS :150 ng/kg bw.d
PFOA:1500 ng/kg bw.d

Sources: US National Toxicology Program, (2016); C8 Health Project Reports, (2012); WHO IARC, (2017); Barry et al., (2013), Fenton et al., (2009); and White et al., (2011).

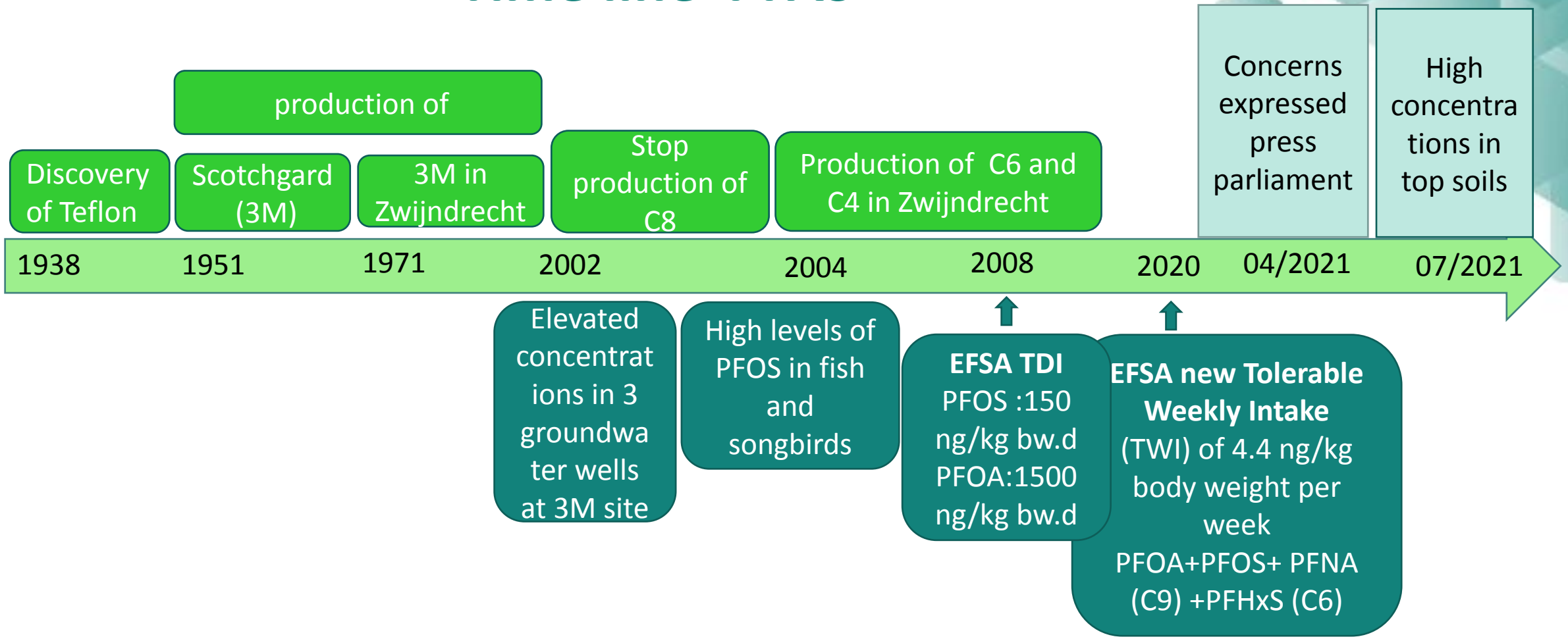
Antwerp and the 3 M site





DS Infografiek

Time line PFAS



PFOS levels in top soil before start of the excavation
Average for Flanders: 0.78 µg/kg dm

Sources: Vlaamse overheid, ERM, Lantis

Response of the local community

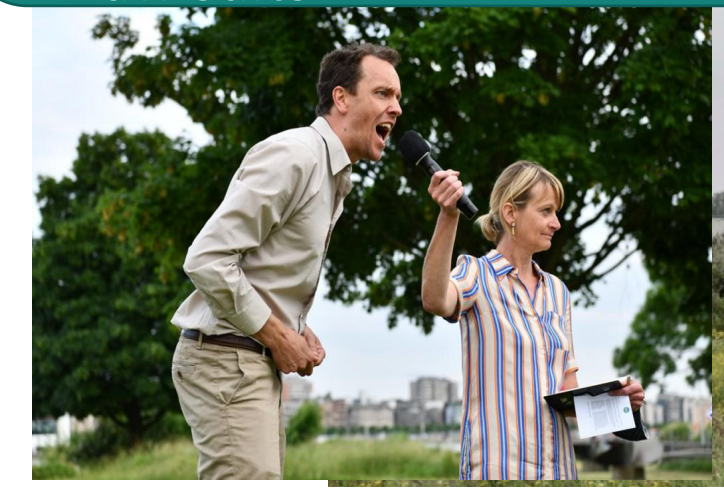
Starting April- June 2021

Residents:

- Our health?
- Locally produced food?
- Value of our residences?
- Who will pay?

Action groups:

- Support from experts
- Analysis of soil and 9 blood samples
- Media contacts
- Law suits



Response of the authorities

Commissioner (Juni 2021-Dec 2022) K. Vrancken

- Trust building by transparant communication
  - → making all monitoring data available one public web site
  - → reports, podcasts, mailbox
  - →information targeted to community

Information and awareness raising
~~Panic and minimising~~

- Building partnerships among stakeholders

Sanitation alliance: local authorities , constructor, nature organisations, action groups , 3M

- Knowledge building
  - Scientific expert group: monitoring + exposure modelling towards a risk based approach
  - Supporting policy makers (Ministry of Environment, Health , Public Works)

New Research:
Stronger regulation (soil, water, earthworks)
Expert hub: dealing with substances of very high concern- precautionary

No regret measures (recommendations to limit exposure < 3 km from 3M site)

- No consumption of home grown vegetables (pregnant women and children)
- Limited consumption of home grown vegetables
- No consumption of well water for drinking or watering of vegetables
- Maximum one local egg/ week
- No consumption of home grown animals
- Healthy diet purchased from different sources
- Good personal hygiene/ wet cleaning of the indoor
- Covering loose soil, limiting soil drift,
- Not allowing children to play on fallow land

AGENTSCHAP ZORG & GEZONDHEID

Parliamentary commission of inquiry:
Ministers, 3M, Administrators, Scientists
25 June 2021⟶ 28 March 2022

Earth moving committee:
14 July 2021

Scientific experts- advice on continuation of construction works and health risks for residents

Monitoring data

- Groundwater
- Soil
- Particulate matter
- Dust
- Vegetables
- Chicken eggs
- Human serum samples

- Gaseous air samples
- Flue gas

Method development and accreditation
LOD/LOQ?

> C8 (linear and branched PFOA,PFOS,PFHxS)
C4 – C7
Perfluorinated organic acids
Perfluorinated sulphonic acids
Perfluorinated sulphonamides
Intermediates: PFBSA

Precursors:
4:2 FTS, 6:2 FTS, 8:2 FTS, 10;2 FTS

Alternatives:
ADONA, GenX

Research

HUMAN EXPOSURE:

Human biomonitoring

800 participants > 12 years old

→ Refining no regret measures

→ Internal exposure data of 10 PFAS compounds

Exposure modelling: Setting risk based limit values for soil and groundwater

Analysis of PFAS in homes (dust), local food, serum of residents

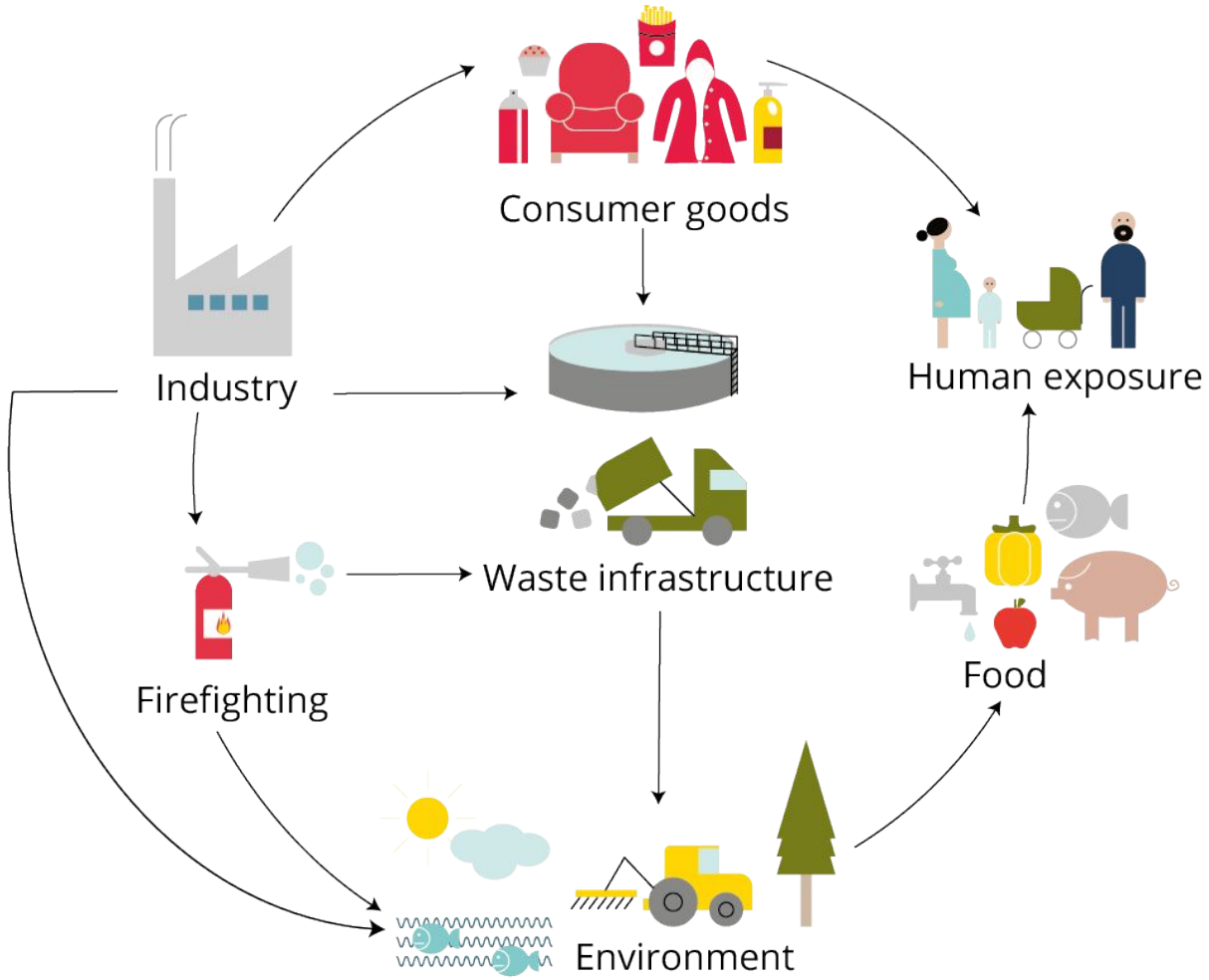
HEALTH:

Analysis of cancer incidence data of Zwijndrecht

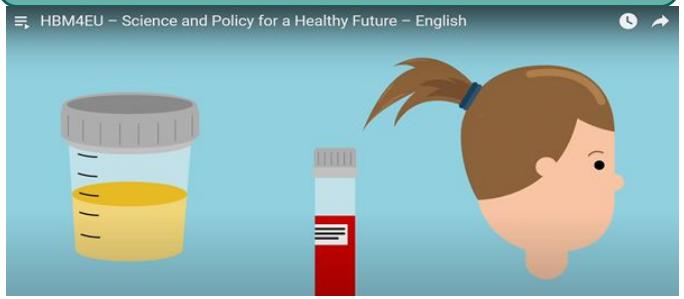
Human biomonitoring of 300 adolescents : exposure and effect

January 2023: 40 000 residents are invited < 5km from 3M site to have their serum analysed to know what is in their body

PFAS exposure pathways for humans

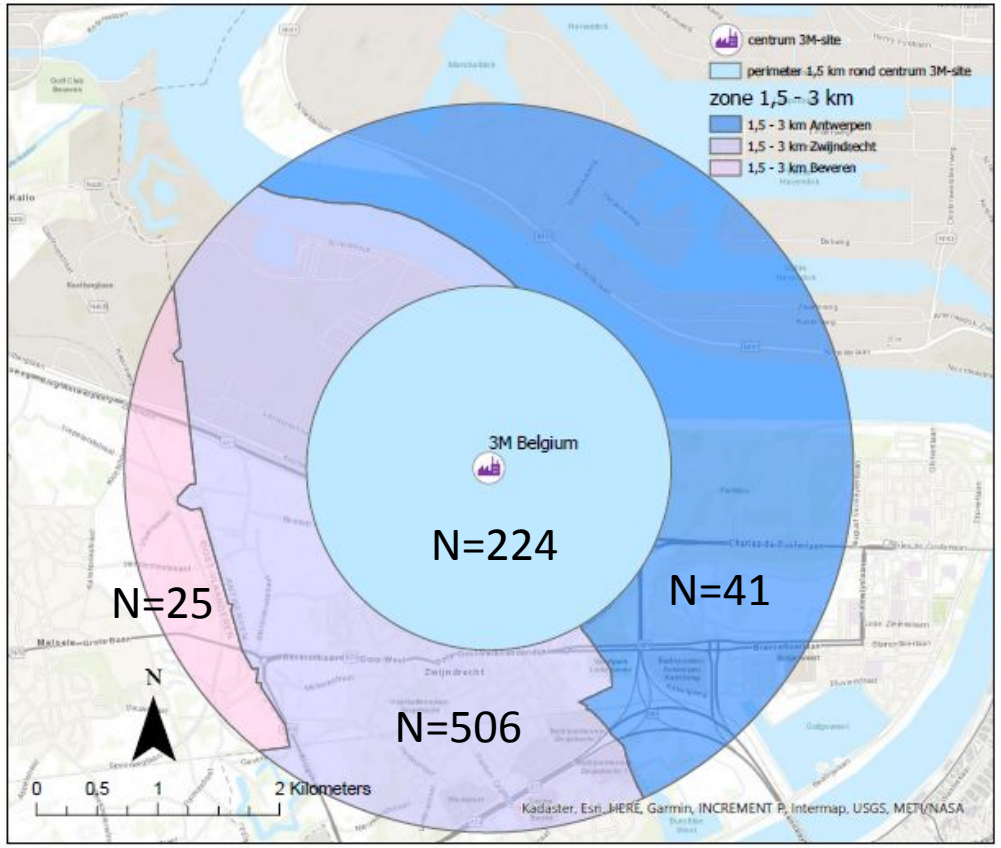


HUMAN BIOMONITORING



Source: https://www.eea.europa.eu/publications/emerging-chemical-risks-in-europe

Recruitment of ≈ 800 residents

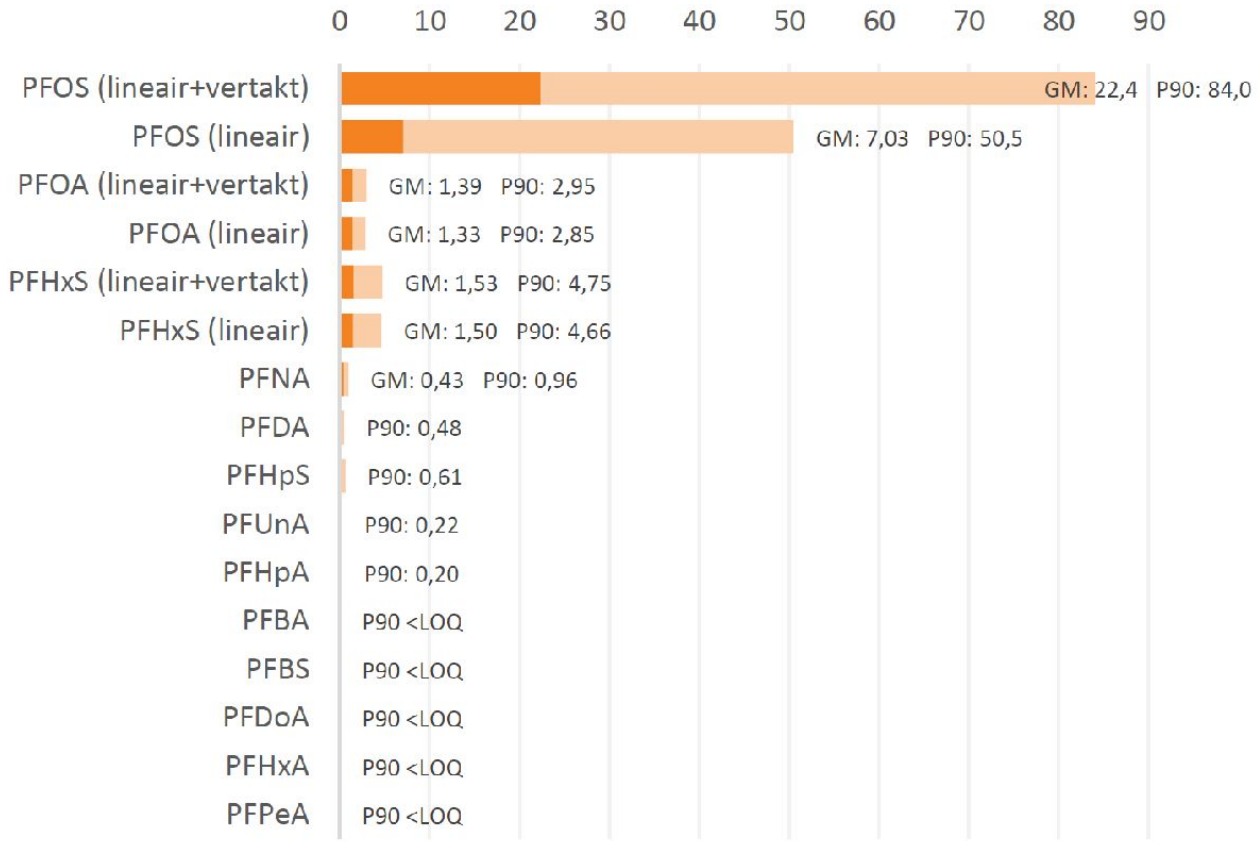


All residents invited < 3 km
>12 jaar: 12.089
1 participant /household
Stratification per age group
Max. 800 participants
Blood sampled

Family and health
Residence : garden? Well water
Diet: home grown food? type?
Education, occupation?
Hobbies, product use?

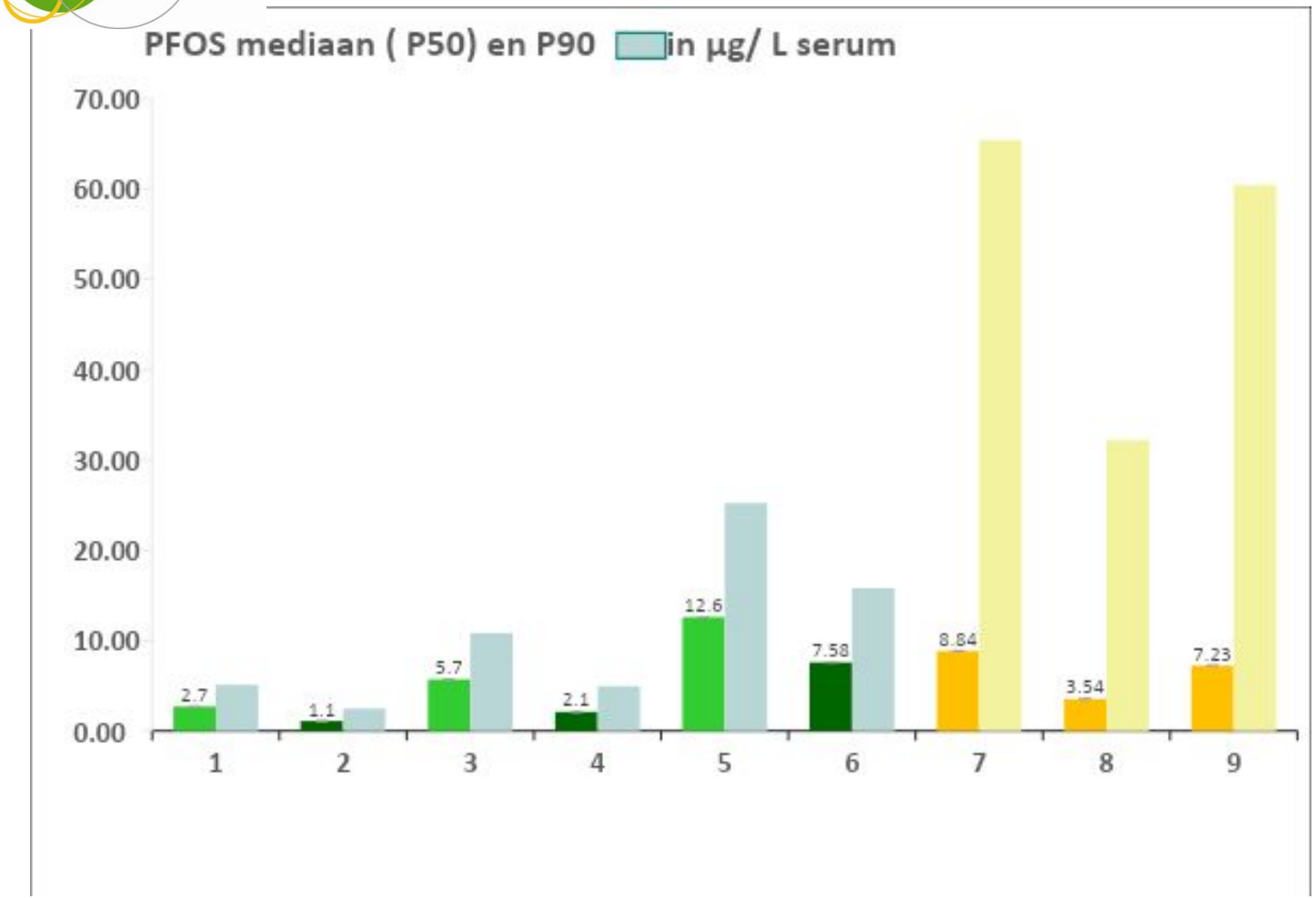
Serum levels of residents < 3km of 3M site: mainly PFOS, PFHxS, PFOA en PFNA

Geometric mean (dark orange) and P90 (light orange) in µg/L of adolescents <3km from 3M site n=796, 12-79 yrs



Exposure determinants	Linear PFOS
Men versus women	+15%
Older participants	+10%
Non Belgians/ Belgians	-45%
Obese/ not obese	-20%
> 30 years in study area/ > 5 yrs	+56%
Consumption of own eggs/ never	+202%
Always eggs from area/never	+105%
Use of well water	+41%
Living < 1.5 km of 3M/ 1.5-3 km of 3M	+42%

PFOS in general population and in the vicinity of 3M plant
Median concentrations(P50) and P90



Exceedance of health based guidance values

6,9 ng/mL PFOS+PFHxS+PFOA+PFNA

17% of Flemish teenagers (2017)

62% of residents < 3km of 3M

↓

Adverse health outcomes cannot be excluded

Bevolkingsonderzoek PFAS bij omwonenden van de 3M site in Zwijndrecht , Feb 2022 , VITO &PIH in opdracht van AZG

Bevolkingsonderzoek PFAS bij omwonenden van de 3M site in Zwijndrecht. Technisch-wetenschappelijk rapport | Vlaanderen.be

Risk based setting of Limit values

FOOD:

→ Estimated PFAS intake by food in Be (average population) of 3,8 – 10,6 ng/kg bw/w **already fills up the EFSA 2020 TWI** of 4.4 ng/kg .w

→food action limits based on EFSA 2008, no limits for fruit and vegetables

→ **limit highest risks – implementation of no regret measures**

SOIL:

→ soil sanitation limit setting : differentiation according to soil destination (agriculture/ residence/ recreation/ industry

→ **strenghtening sanitation limits** , residential areas decreased for PFOS (4x), for PFOA (10 X)

→ **strengtening limits** for free transport of soil : 3 µg/kg ds PFOS, 2 µg/kg ds PFOA, 8 µg/kg ds som PFAS

- Drinkingwater limit: 0.1 µg/L for sum of 20 PFAS and 0.5 £g/L for sum of all PFAS
- Emissions – effluents: below quantification limits
- Emissions –air: development of analytical techniques ongoing

Communication to public

- No acute effects but long term health effects cannot be excluded
- Strenghtening of limit values (eg. for soil sanitation) but not yet compatible with new EFSA guideline values of TWI
- Recommendations to limit exposure – no regret measures
- Possibility to have serum analysed < 5 km from 3M site
- Health studies: long term follow up
- Start sanitation works of contaminated areas
- Monitoring of contamination during construction works
- Active participation of Flanders and Be at EU level to further restrict PFAS compounds

Response of the company

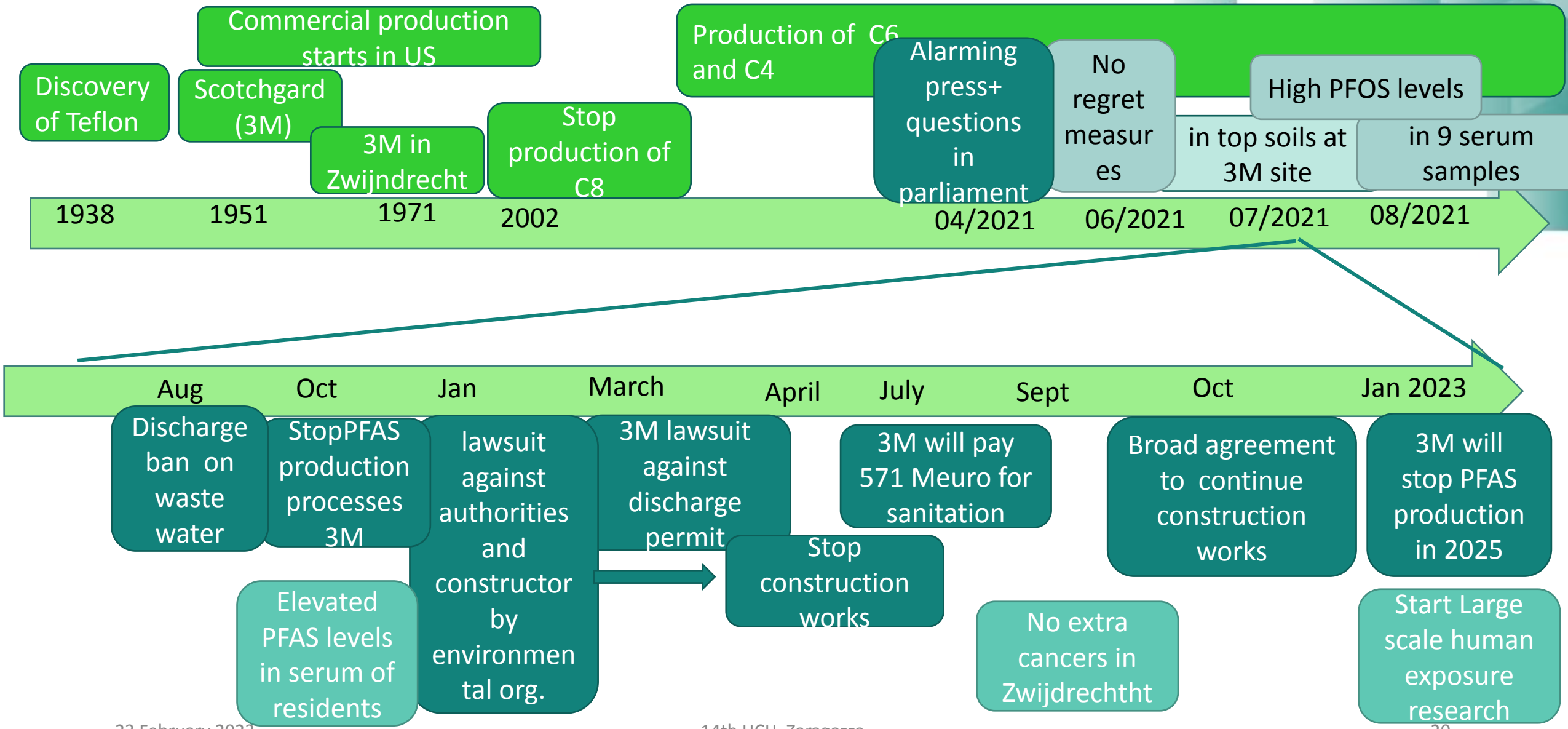
Financial agreement with authorities: 571 M€

115 M€	
5 M€	**Support for local farmers**
250 M€	**Most urgent remediation works**
100 M€	**To Flemish authorities to carry out 3M site related actions**
100 M€	**Financial support and services towards constructor**
1,3 M€	**Renunciation of subsidies**

Stop production of all PFAS in 2025:

- Stronger regulations
- Damage claims

Time line 3M PFAS



20

THANK YOU FOR YOUR ATTENTION

greet.schoeters@uantwerpen.be

https://www.vlaanderen.be/pfas-vervuiling