

PFAS Restriction Proposal

- focus on fluorinated gases

Presented by: Audun Heggelund,
Norwegian Environment Agency



Restriction proposal - content

- **REACH = Registration, Evaluation, Authorisation and **restriction** of Chemicals**
- **Restriction proposal:**
 - ✓ Chemical identity
 - ✓ Hazards, risks, effects
 - ✓ Applications
 - ✓ Availability of alternatives
 - ✓ Socio-economic analysis – impact assessment
 - ✓ Restriction entry



«Forever chemicals»

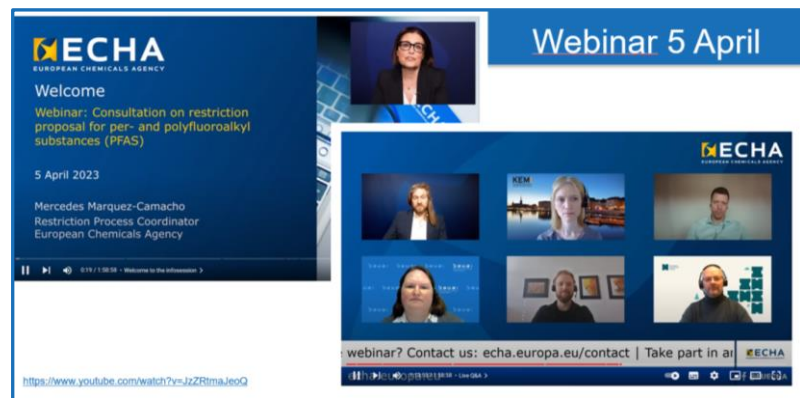
- All PFASs in scope of this restriction proposal are either persistent themselves or degrade to other persistent PFASs
- Persistence due to strength of the carbon-fluorine bond
- Applies also for fluorinated gases that are PFAS

Restriction process – next steps

- Public Consultation, 22 March – 25 September 2023

ECHA webinar 5 April

<https://www.youtube.com/watch?v=JzZRtmaJeoQ>



Sectors/uses of PFASs



Rainwear



Non-stick coating



Cosmetics



Medical equipment

- Industrial processes
- Firefighting foams
- TULAC
- Food contact materials (incl. packaging)
- Metal plating/metal products
- Consumer mixtures
- Ski wax
- Transport

- **Applications of fluorinated gases**
- Electronics and semiconductors
- Energy sector
- Construction products
- Lubricants
- Petroleum and mining
- Medical devices
- Cosmetics
- Other uses

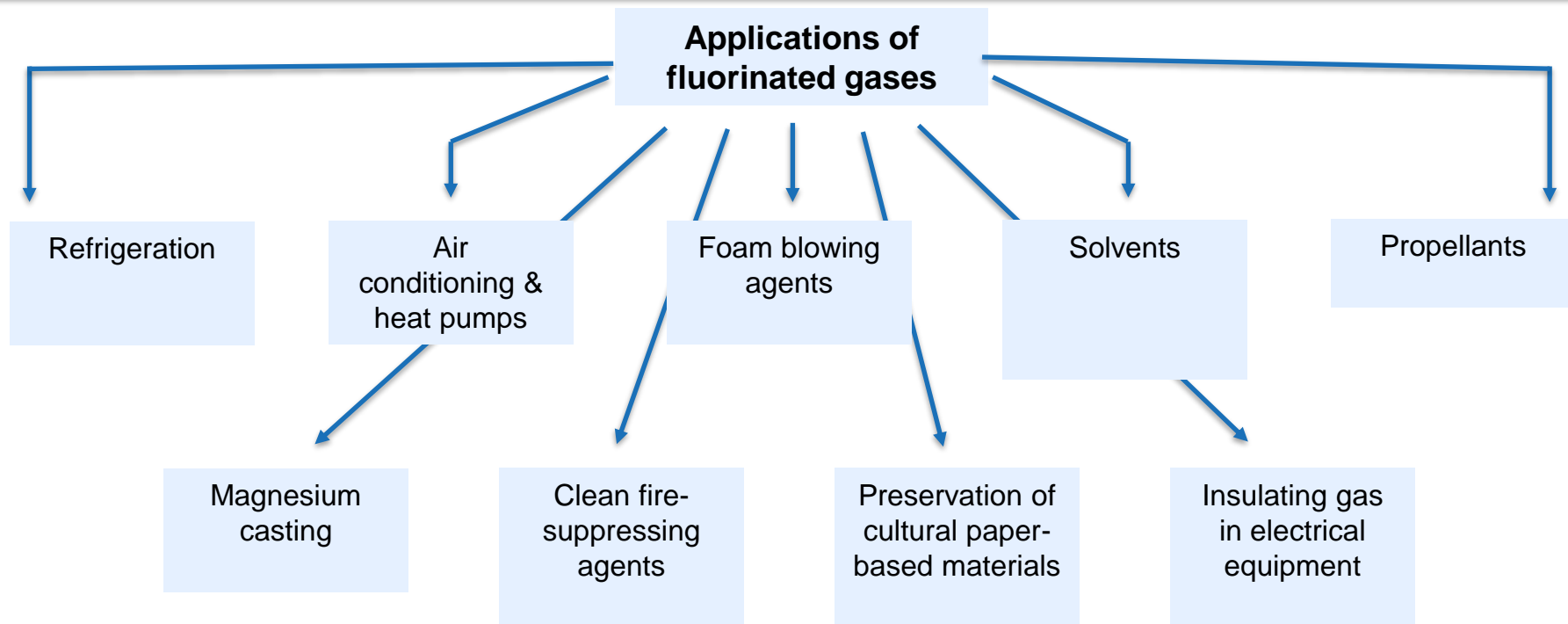
PFAS restriction – fluorinated gases



Photo: Audun Heggelund

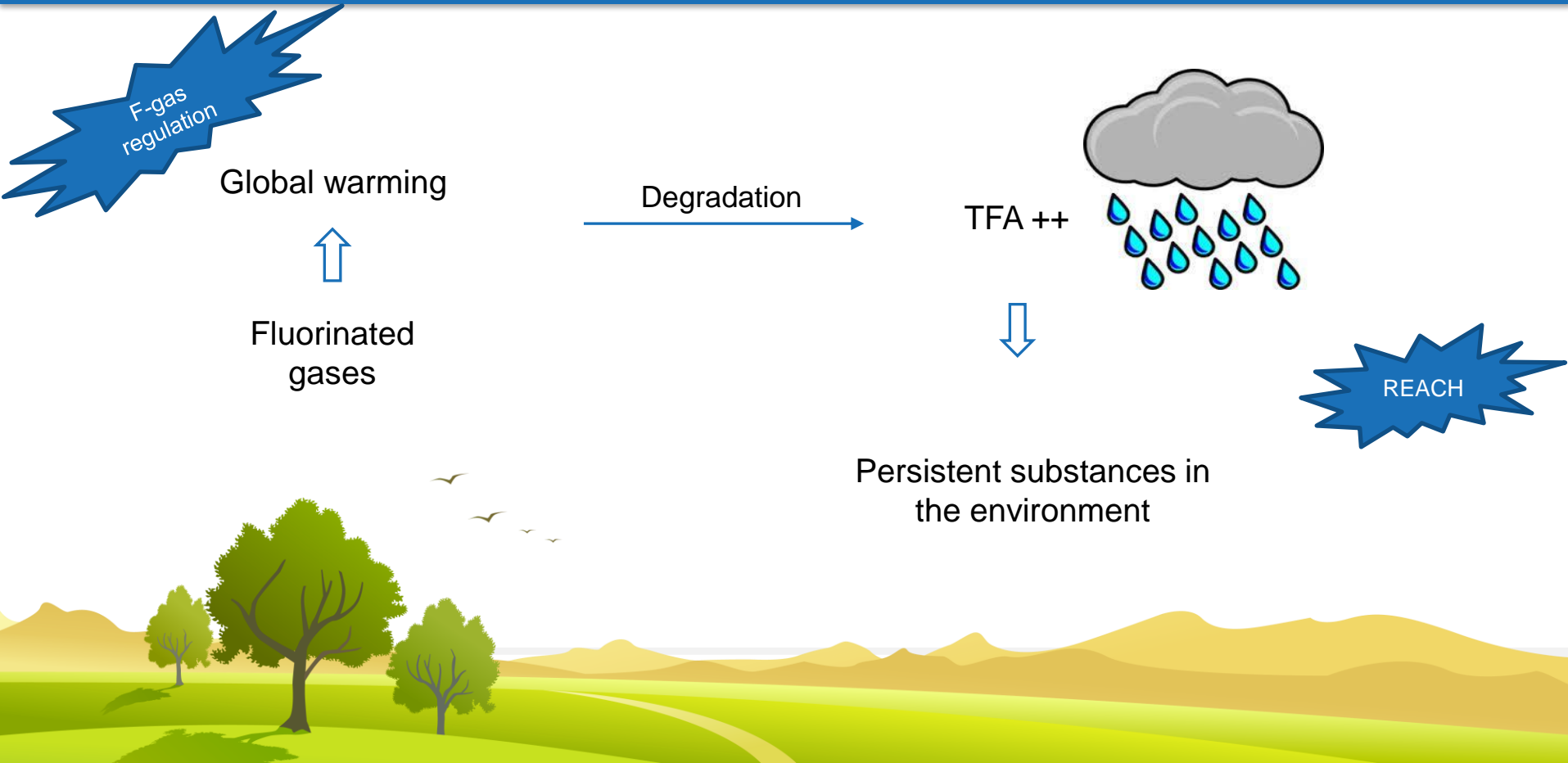
Most F-gases are within the scope of the PFAS restriction (not e.g. HFC-23, HFC-32, HFC-152a)

Fluorinated gases: applications

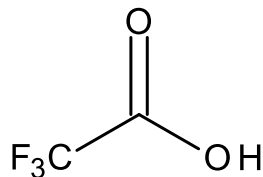
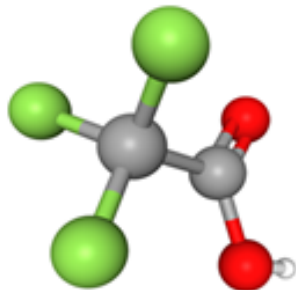


Annual emissions of fluorinated gases in the EU/EEA: 39 000 tonnes

Fluorinated gases – atmospheric degradation and concerns



Trifluoroacetic acid - TFA



TFA

- Fully fluorinated version of acetic acid
- Colorless liquid, boiling point 72 °C
- Relatively strong carboxylic acid
- Used in various industrial applications
- **Harmonized Classification: H412 - harmful to aquatic life with long lasting effects (Aquatic Chronic 3)**
- Microalgae *Raphidocelis subcapitata* most sensitive organism i freshwater
- Persistent in the environment – mobile in water
→ vPvM
- Difficult to remove in purification

Sources of TFA in the environment¹

- Potentially natural sources in the ocean (200 ng/L) – deep-sea vents²
- Industrial uses of TFA (100 - 1000 t/y)
- Degradation of fluorinated gases from e.g. refrigerants
- Degradation of pharmaceuticals, biocides and plant protection products
- Degradation of other substances containing C-CF₃
- Incineration of PFAS, including fluoropolymers

1. Freeling & Björnsdotter (2023), *Current Opinion in Green and Sustainable Chemistry*, 41, 100807.

2. Frank et al. (2002), *Environmental Science & Technology*, 36, 12-15.

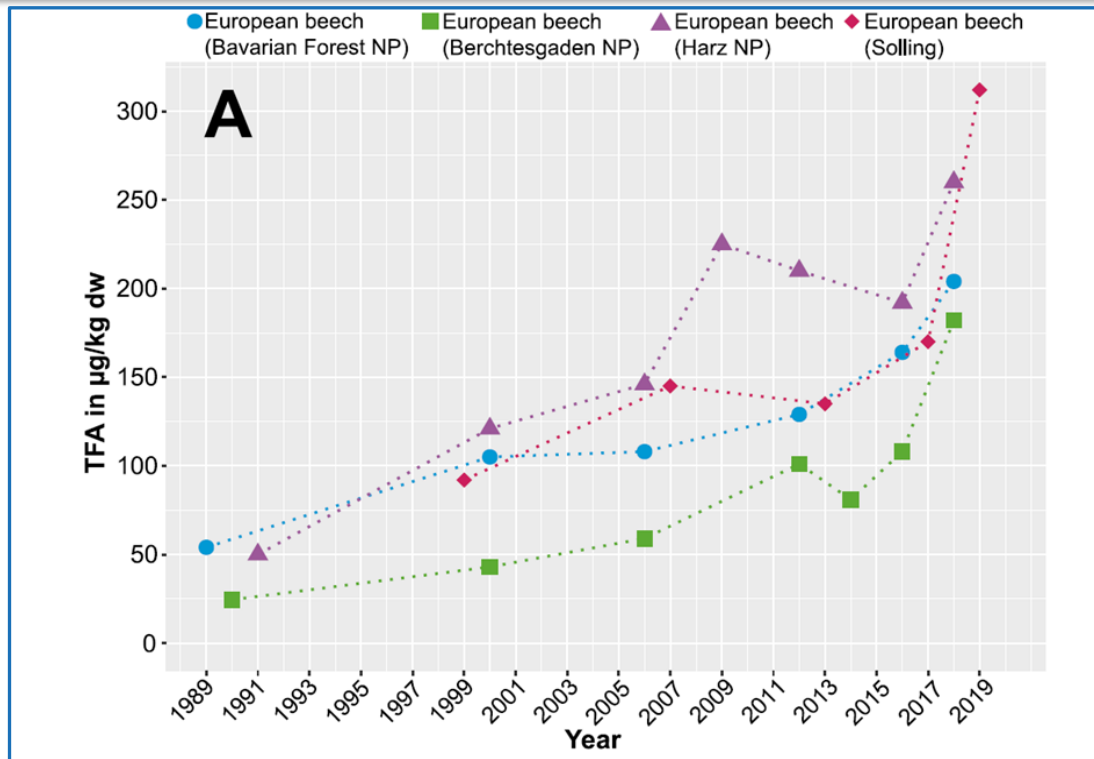
About naturally occurring TFA

- More than 10 000 different PFAS – 1 may have natural sources
- Natural sources questioned in a study from 2021¹
- TFA in other compartments than the ocean from antropogenic sources²
- No TFA in ice-core samples from Greenland (4000 years old)²
- Increasing levels of TFA in rainwater – as well as in freshwater and plants, especially in urban areas³
- TFA in rainwater in Germany (2018-2019) on average at 335 ng/L⁴

1. Joudan et al. (2021), *Environmental Science Process & Impacts*, 23, 1641-1649.
2. Nielsen et al. (2001), *Atmospheric Environment*, 35, 2799–2801.
3. Freeling & Björnsdóttir (2023), *Current Opinion in Green and Sustainable Chemistry*, 41, 100807.
4. Freeling et al. (2020), *Environmental Science & Technology*, 54, 11210–11219.

TFA in leaves

TFA in leaves of European beech from four locations in Germany



Freeling et al. (2022), *Env. Sci. Tech. Lett.*, 9, 400-405.

F-gas regulation

- **Regulation (EU) No 517/2014 (F-gas regulation) – currently under revision**
- **Addresses global warming from F-gases**
- **Gradual phase-down of the F-gases' total contribution to global warming**
- **Measures volumes in CO₂-equivalents based on the individual gases' GWP value**
- **Does not address persistent substances in the environment**
- **Contains list of prohibitions on specific applications of HFCs and PFCs, often over a given GWP**

Restriction Options (RO's) assessed

RO1

Full ban of all uses

- Transition period: 18 months

RO2

Ban with use-specific derogations

- Transition period: 18 months
- Duration of derogation:
 - 5 years (based on set criteria relating to alternatives)
 - 12 years (based on set criteria relating to alternatives)
 - Time-unlimited derogations (specifically justified)

Summary and next steps

- **Restriction for PFAS, including fluorinated gases, proposed**
- **For fluorinated gases main concern is persistent degradation products (e.g. TFA) that are increasing in freshwater and the terrestrial environment**
- **Public Consultation 22 March – 25 September 2023**

