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V. Questions - Section A - General questions

For which use would you like to submit information? Please select all uses on which you would like to provide information.

- [ ] Cleaning agents, polishes, waxes (non-industrial uses)
- [ ] Cosmetics
- [x] Food contact materials & packaging
- [ ] Lubricants
- [x] Construction products
- [x] Medical devices
- [ ] Medicinal products
- [ ] Metal plating & manufacturing of metal products
- [x] PFAS production (manufacturing)
- [x] Ski treatment
- [x] TULAC (textiles, upholstery, leather, apparel and carpets)
- [ ] Petroleum & mining
- [x] F-gases
- [x] Electronics & energy
- [ ] Transportation
- [x] Waste

Are certain uses of PFAS missing in the categories above?

1) Fire-fighting foams. Likely all covered by PFHxA restriction.

2) Fire protection applications (non-foam), e.g. Novec 1230 by 3M (EC 436-710-6).

V. Questions - Section B - Food contact materials & packaging

Do you have information that indicates that the information provided on the emissions should be adjusted?

- (•) Yes
- ( ) No

A factor of 6 between used tonnage and emissions (e.g. 827 vs. 124) raises the question: what happens to the rest? It is unlikely that stocks of these materials in the use phase are increasing; in other words: production and emissions from end-of-life will be roughly equal, even if the latter are likely substantially delayed in the case of landfills.

Even where there are numerical uncertainties, the mass balance (Lavoisier) must be respected for a convincing dossier.

Incineration of household waste (ca. 50% in the EU) occurs around 850 °C, a temperature too low to lead to stoichiometric formation of inorganic fluoride.

Combustion products from e.g. PTFE at 850 °C are largely CF4, CHF3 and other potent and long-lived GHGs (see García 2007, Huber 2009 and US EPA 2020).

Radical mechanisms postulated in Ellis 2001 hint to similar decomposition pathways from other PFAS.

All documents are available from: https://tinyurl.com/4huwfcey

(EEB's document library)

Do you have information that indicates that the information provided on the expected trend should be adjusted?

- (●) Yes
- ( ) No

The quantitative trend information is accompanied by numerical information (e.g. 5%). Does this figure refer to annual growth estimates? If so, for which period? Infinite growth in a finite system is not a realistic assumption, certainly not in a mature technology.

Do you have information on additional alternatives for any of the described applications that have not been disclosed in the attached information?

The background document is technically incorrect and out of date:

1) section 2.1, 1st bullet point: PFOS sulphonamides are not telomeric, were phased out 20 years ago and are not registered any more, and therefore not in legal use.

2) No 8:2 diPAPs are registered, and they are banned by REACH as they are PFOA-related.

3) Practical analyses (e.g. Chemtrust and Arnika report) show pervasive presence of 6:2 FTOH, a clear marker of C6 fluorotelomer chemistry. These substances are all covered by the restriction of PFHxA.

4) German FCM approvals (BfR's annex XXXVI, available from EEB's library: https://tinyurl.com/tdk2bycc) show that modern substances are based on 6:2-FTOH (see (3)) or on on pf-polyethers (overlooked in the background document). The NL Warenwet list is outdated by at least 20 years.

5) bullet point 6: the sidechains (6:2 FTOH) are POLYfluorinated

6) In table 1, relevant processing aids such as ADONA (EC 480-310-4), C6O4 (EC 682-239-6) and EC 700-323-3 are missing.

What is the economic impact (in euro) and social impact (e.g. jobs) on your business/company if the use of PFAS is prohibited?

a) In 3 years.

EEB is not impacted, but we would like to stress that responses will likely be dominated by negatively impacted companies, not by those who benefit from a restriction.

If available, please proivde data on (PFAS impurities in) polymer production aids emission during the production of consumer cookware & industrial applications.

The polymer production aids are mostly PFAS, not only their impurities.

Consider substances suchas Gen X (EC 700-242-3), ADONA (EC 480-310-4), C6O4 (EC 682-239-6), diglycol acetate EC 700-323-3.

If available, please provide information on the use of fluorinated gas or fluorinated processing aids in plastic packaging production (food as well as non-food packaging).

Consider substances such as Gen X (EC 700-242-3), ADONA (EC 480-310-4), C6O4 (EC 682-239-6), diglycol acetate EC 700-323-3.

V. Questions - Section B - Construction products

Do you have information on additional alternatives for any of the described applications that have not been disclosed in the attached information?

The first item in the list, on thermal insulation, is ambiguous. Thermal insulation foams are normally not made of any PFAS, not least because fluoropolymers are difficult to process, expensive, and do not offer advantages in thermal conductivity.

However, PFAS (notably F-gases such as 1233zd (marketed by Arkema as Forane(R)) are used as blowing agents to make foams, especially for on-site spray foams.

However, fluorine-free alternatives that can be used in broad application spectra have been on the market for many years, ever since the phase-out of HCFCs and CFCs.

A comprehensive report by Germany's GIZ and BMZ from 2009 is available here: https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/giz2009-en-natural-foam-blowing-agents.pdf

V. Questions - Section B - Medical devices

Do you have information that indicates that the information provided on the emissions should be adjusted?

- (●) Yes
- ( ) No

Regarding the last sub-use category: medical devices incl. packaging are usually incinerated after use, especially where they are contaminated with bodily fluids, constituting a biohazard. Like municipal waste, clinical waste is generally not incinerated at temperatures converting organic fluoride (i.e. PFAS) into inorganic fluoride - see our comments in the section on waste for concepts and literature references.

The highly defective mass balance (what happens to the 3,610-13,910 unaccounted tons of PFAS?) means that further data or assumptions are needed.

Are in your view non-PFAS alternatives technically feasible in your product(s)/processes?

- (●) Yes
- ( ) No

● Rue des Deux Églises 14-16, 1000 Brussels, Belgium ● ☏ +32 228 91090 ● eeb@eeb.org ● www.eeb.org
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Although we do not produce or handle medical devices ourselves at EEB, we would like to bring to your attention our contribution to question 5 of the public consultation on the draft SEAC opinion of the restriction proposal on PFHxA, its salts and related substances.

Do you have information on alternatives for any of the described applications in the attached information?

Although propellants of inhalers are acknowledged for their use and emissions of GHGs, little information is provided on alternatives.

A useful assessment of costs and benefits was published a few years ago: Wilkinson et al. 2018 http://dx.doi.org/10.1136/bmjopen-2018-028763

V. Questions - Section B - PFAS production (manufacturing)

Do you have information that indicates that the information provided on the tonnage should be adjusted?

- (●) Yes
- ( ) No

The "remaining PFAS" currently still in legal use are mostly of 3 categories: PF-ethers, C4 and C6. The C6 substances are in scope of the restriction proposal on PFHxA, its salts and related substances, including for manufacturing aspects. In many such applications (paper, TULAC, electronics, ski...) PFAS are being replaced or will be replaced by other substances than PFAS.

The C6 substances being a large part of the remaining PFAS, a trend "-" would make more sense, despite the often indiscriminate derogations in the said restriction proposal.

We assume that illegal imports (e.g. articles treated with C8 chemistry) are not meant here.

V. Questions - Section B - Ski treatment

Do you have information that indicates that the information provided on the emissions should be adjusted?

- (●) Yes
- ( ) No

(regrettably it is not possible to provide a comment here by clicking "no", although explicitly confirming the proposal would be a constructive way to comment)

Thank you for providing an emission estimate with a plausible mass balance.

Do you have information that indicates that the information provided on the expected trend should be adjusted?

- (●) Yes
- ( ) No

This trend should probably be readjusted to "--", for two reasons:

1) the International Ski Federation FIS has banned all PFAS in professional competitions (https://www.fis-ski.com/en/ski-jumping/ski-jumping-news-multimedia/news/2020-21/ski-wax-only-without-fluorine). It is to be expected that amateur sports will also follow, although public awareness (and thus pressure) is probably much lower.

2) The only active ingredient currently registered in the EU is likely EC 432-570-5, which is in scope of the restriction on PFHxA and related substances. Of course, given the small total volume, it is not unlikely that other active substances are produced or imported in amounts below 1 t/y, thus escating REACH registration. Although a restriction does not mean that use will effectively cease completely, there is a high probability that volumes will decrease dramatically linked to legality issues.

What is the economic impact (in euro) and social impact (e.g. jobs) on your business/company if the use of PFAS is prohibited?

a) In 3 years.

As mentioned before, this question is possibly without major practical substance, as ski waxes currently on the market are likely mostly covered by the restriction on PFHxA and related substances.

V. Questions - Section B - TULAC (textiles, upholstery, leather, apparel and carpets)

Do you have information that indicates that the information provided on the expected trend should be adjusted?

- (●) Yes
- ( ) No

The summary report correctly identifies decreases in the consumer garment (=outdoor) sector.

However, the logic behind the overall "++" rating is difficult to follow.

1) The increase (not even "strong increase") mentioned for outdoor textiles in the background document, section 5, is not explained, backed-up, nor obvious.

2) PPE not related to medical applications (e.g. against heat, cuts or dust, i.e. "professional apparel") have not grown as a result of the Covid crisis.

3) Some medical PPE has increased because of the Covid crisis, but should not be expected to keep growing at similar rates, unless the health crisis is expected to worsen substantially. Therefore this sector (anyway minor in terms of volume) would rather have a "0" or "-" rating.

4) A major application of PFAS is for contact with bodily fluids, e.g. in surgical gowns. Whereas facemasks have definitely become more popular in the Covid crisis, they do not have a PFAS treatment. Why would surgical gowns have grown?

Do you have information on additional alternatives for any of the described applications that have not been disclosed in the attached information?

The PTFE membrane often used in outdoor textiles (class 2 in the background document) has been replaced by several industrial actors (including, but not limited to Jack Wolfskin, Fjällräven and Vaude)

● Rue des Deux Églises 14-16, 1000 Brussels, Belgium ● ☏ +32 228 91090 ● eeb@eeb.org ● www.eeb.org
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by fluorine-free, e.g. polyurethane membranes. See EEB's recent scorecard for technical details: https://tinyurl.com/f2w9s55r.

V. Questions - Section B - F-gas uses

Are in your view the listed non-PFAS alternatives technically feasible in your product(s)/processes?

- (•) Yes
- ( ) No

A 2019 UNEP report (https://ozone.unep.org/sites/default/files/2019-04/RTOC-assessment-report-2018_0.pdf) analyses the different refrigerant gases and their usefulness in the different cooling and heat pump systems. The report concludes that CO2, ammonia and hydrocarbons have a very broad spectrum of application. Higher training needs are mentioned (which may be regarded as positive or negative); on the other hand training for the safe recuperation of F-gases will become easier.

Do you have information on additional alternatives for any of the described applications that have not been disclosed in the attached information?

As useful summary of available technologies and recent advances we would like to recommend the following website: https://cooltechnologies.org/

Further fluorine-free refrigerants missing from the list include water and cyclopentane (only mentioned as a blowing agent).

V. Questions - Section B - Electronics & energy

Do you have information that indicates that the information provided on the emissions should be adjusted?

- (•) Yes
- ( ) No

The emissions of the different sectors are again much lower than the used tonnages. As always, it is unclear what happens to the missing tonnage - especially as recycling is low in this area.

Fluorinated technology is a mature technology, therefore outflows from the use phase should be roughly equal to the inflows.

What happens to the missing tonnage? Realistic assumptions are fine, not providing any scenario is not.

What is the specific application/functionality of PFAS in your product(s)/processes?

EEB is not involved in the production or processing of PFAS.

We would like to point to our submission into the Public Consultation on the SEAC draft opinion of the PFHxA restriction, answer to question 3 for further information on the use of PFAS in electronics.

Are there legal approval schemes for your product(s)/processes, which have to be taken into account in case PFAS alternatives will be used?

● Rue des Deux Églises 14-16, 1000 Brussels, Belgium ● ☏ +32 228 91090 ● eeb@eeb.org ● www.eeb.org
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- (●) Yes
- ( ) No

We would like to highlight that some of the materials in this section are at the same time construction materials and that there may be an overlap between categories.

Do you have information on additional alternatives for any of the described applications that have not been disclosed in the attached information?

Typical backsheets of PV cells are made of PVB, not mentioned here.

Cable insulation can be made from polyolefins and PVC, to name some classic alternatives.

V. Questions - Section B – Waste

Do you have information that indicates that the information provided on the emissions should be adjusted?

- (●) Yes
- ( ) No

As explained in other sections (e.g. FCM and packaging), incineration of household waste occurs typically at 850 °C with a residence time of 2 s (WI BREF and related monitoring data, available on BATIS). The fluorine in the waste stream (e.g. 43,000 t/y in TULAC) will end up in either the bottom/fly ash or the flue gas. Fluorine can end up as inorganic fluorine (highly poisonous HF gas or, under basic conditions, a fluoride salt such as CaF2); however temperatures well above 1000 °C are required for this transformation to be quantitative.

Combustion products from e.g. PTFE at 850 °C are largely CF4, CHF3 and other potent and long-lived GHGs (see García 2007, Huber 2009 and US EPA 2020).

Radical mechanisms postulated in Ellis 2001 hint to similar decomposition pathways from other PFAS.

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It is important that the mass balance (i.e. Lavoisier's principle) is respected in the Annex XV dossier.

If available, please provide data on PFAS (or total F) measurements in flue gas, fly ash or bottom ash from waste incinerators (Energy from Waste installations, cement kilns, hazardous waste incinerator etc.).

Several papers have discussed the issue; however without reaching a meaningful conclusion on the fate of the fluorine.

Taylor 2014 (doi.org/10.1016/j.chemosphere.2014.02.037) describes combustion at 1000 °C, i.e. unrealistically high temperatures for a municipal waste incinerator (MWI), and report some formation of HF and no formation of PFOA (which would not be an expected combustion product anyway). Yamada 2005 (doi:10.1016/j.chemosphere.2005.03.025) reaches similar conclusions.

● Rue des Deux Églises 14-16, 1000 Brussels, Belgium ● ☏ +32 228 91090 ● eeb@eeb.org ● www.eeb.org
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Aleksandrov 2019 (doi.org/10.1016/j.chemosphere.2019.03.191) confirms that none of a small series of PFAS are formed during combustion of PTFE (as expected), without answering the question of the fate of the fluorine.

Wang 2015 (DOI: 10.1021/es506234b) studies the use of Ca(OH)2 to abate the formation of the long-lived potent GHG in MWIs - however Ca(OH)2 is not routinely used in practice. The quasi-quantitative conversion into those GHGs as the most plausible scenario.