



Database of alternatives to PFAS based on the functional substitution approach

Romain Figuière, Luc Miaz, Eleni Savvidou, Ian Cousins

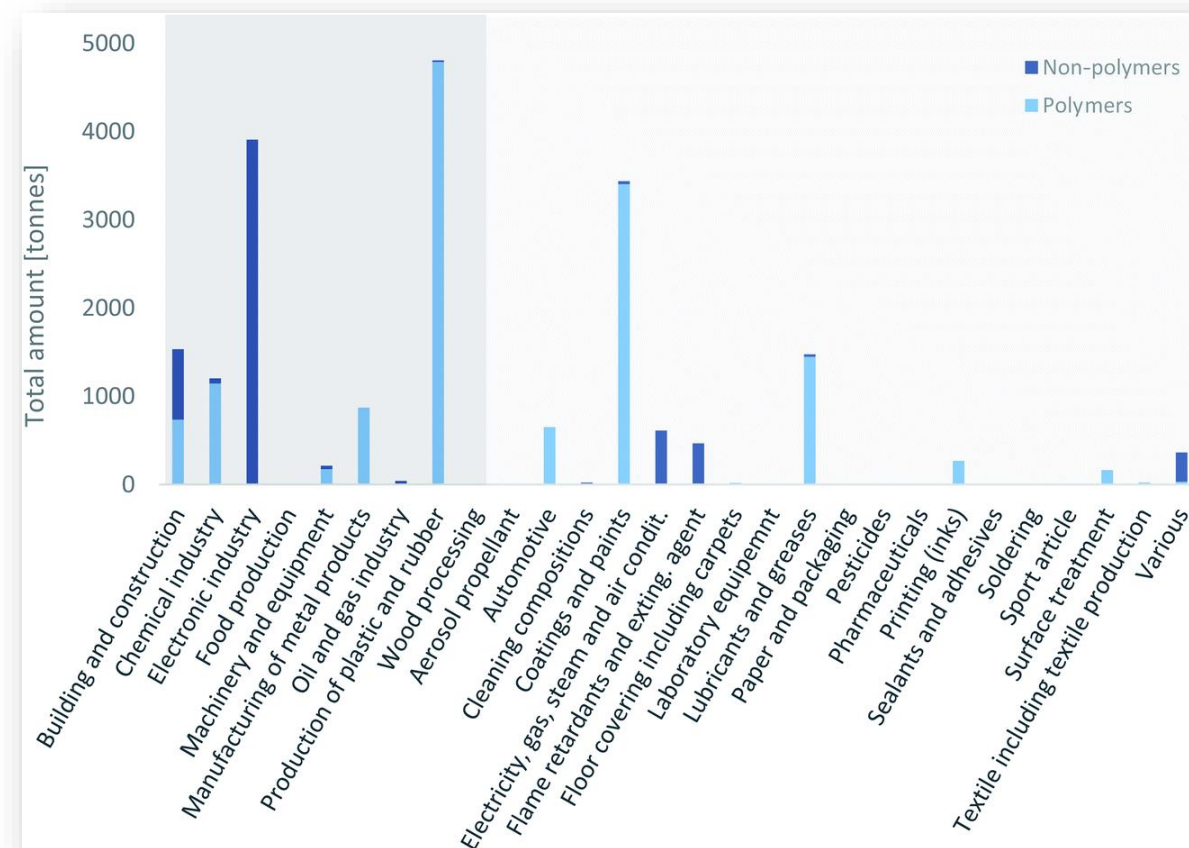
Department of Environmental Science, Stockholm University



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036756.

The issue of PFAS

- Group of substances that contains at least one fully fluorinated methyl (CF_3-) or methylene ($-\text{CF}_2-$) in its molecular structure
- Hundreds of different uses across many sectors have been identified, both in consumer products and in industrial applications



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An overview of the uses of per- and polyfluoroalkyl substances (PFAS)[†]

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Juliane Glüge,^a Martin Scheringer,^{a*} Ian T. Cousins,^b Jamie C. DeWitt,^c Greta Goldenman,^d Dorte Herzke,^e Rainer Lohmann,^f Carla A. Ng,^g Xenia Trier^h and Zhanyun Wang^g

The issue of PFAS

 France 24

'Forever chemicals': French MPs approve PFAS product ban

French MPs on Thursday approved the first reading of a bill aimed at restricting the manufacture and sale of non-essential products...



 Just Style

Denmark to ban PFAS in clothing, shoes from July 2026

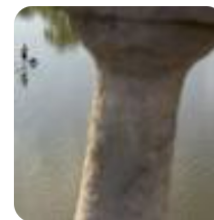
As part of a new PFAS action plan Denmark's government has proposed to introduce a national ban on PFAS in clothing and shoes.



 Pinsent Masons

New UK PFAS restrictions closer as debate over alternatives intensifies

Manufacturers could face restrictions on using per- and polyfluoroalkyl substances (PFAS) – so-called 'forever chemicals' – to make cleaning...




EUROPEAN CHEMICALS AGENCY

ANNEX XV RESTRICTION REPORT

PROPOSAL FOR A RESTRICTION

SUBSTANCE NAME(S): Per- and polyfluoroalkyl substances (PFASs)

IUPAC NAME(S): n.a.

EC NUMBER(S): n.a.

CAS NUMBER(S): n.a.

CONTACT DETAILS OF THE DOSSIER SUBMITTERS:

BAuA

Federal Institute for Occupational Safety and Health
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D-44149 Dortmund, Germany

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Swedish Chemicals Agency (KEMI)
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SE-172 13 Sundbyberg, Sweden

Norwegian Environment Agency
P.O. Box 5672 Torgarden
N-7485 Trondheim, Norway

The Danish Environmental Protection Agency
Tolderundsvej 5
5000 Odense C, Denmark

VERSION NUMBER: 2

DATE: 22.03.2023

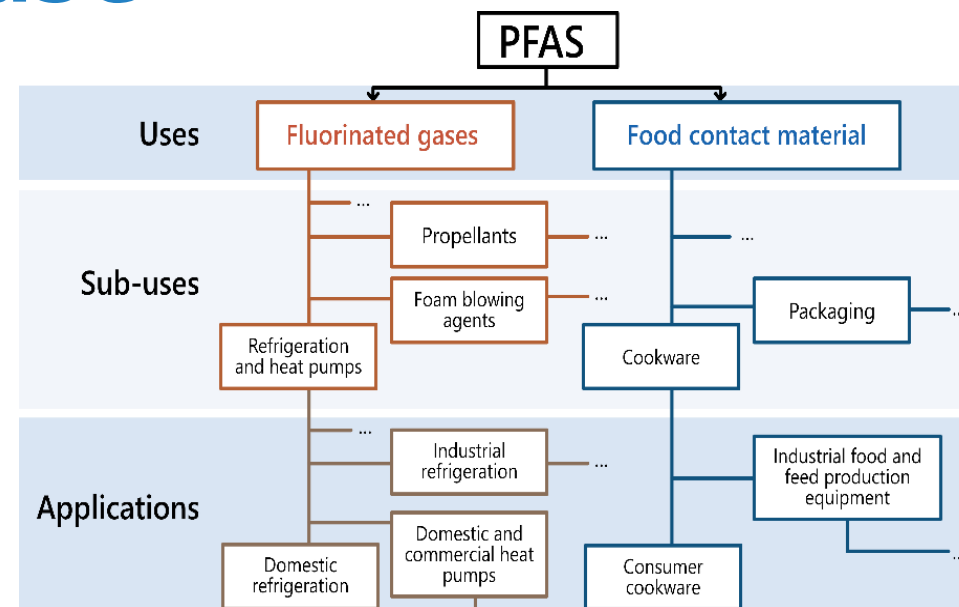
Objectives of the database

- To provide a list of uses of PFAS
- To provide information on the functions of PFAS for each use
- To provide a list of potential alternatives to PFAS for each use with hazard characterization; description of potential performance loss; and market availability



Overview of the database

- List of PFAS for each Use/sub-use/applications determined based on REACH restriction dossier, and similar work



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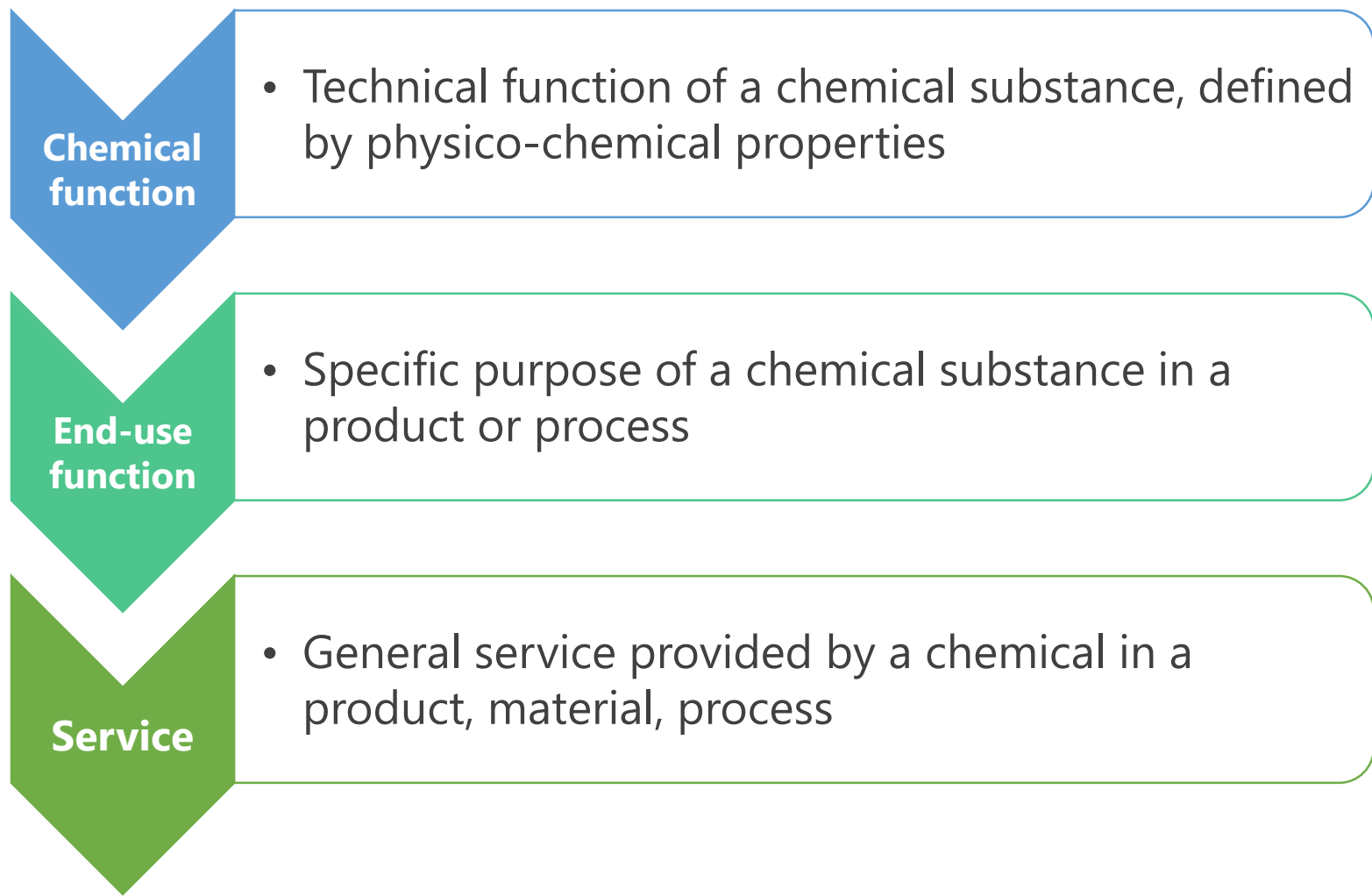
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chemsec

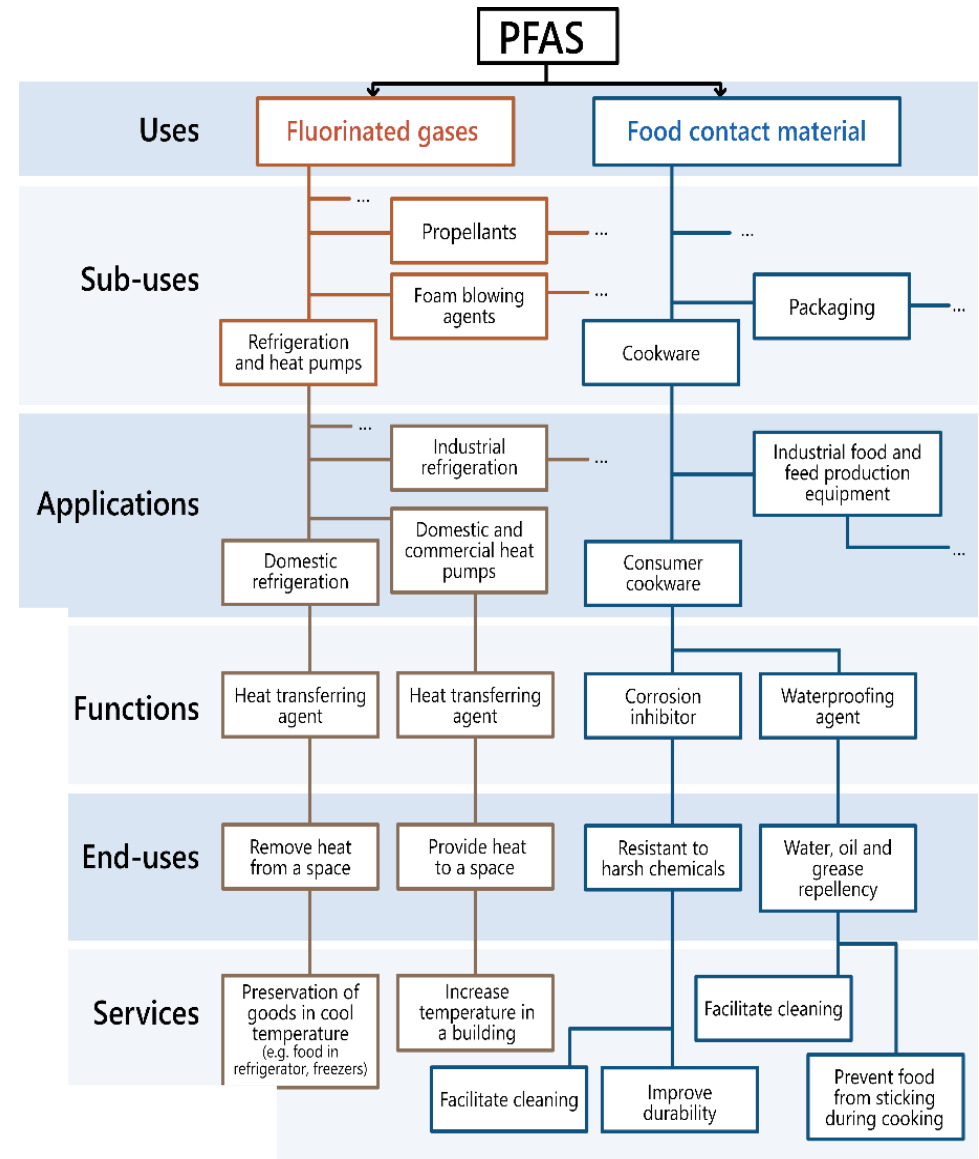
PFASGUIDE

The functional substitution to define the use of a substance



Overview of the database

- Technical function determined based on OECD guidance on harmonized use categories
- End-use and service determined based on common sense



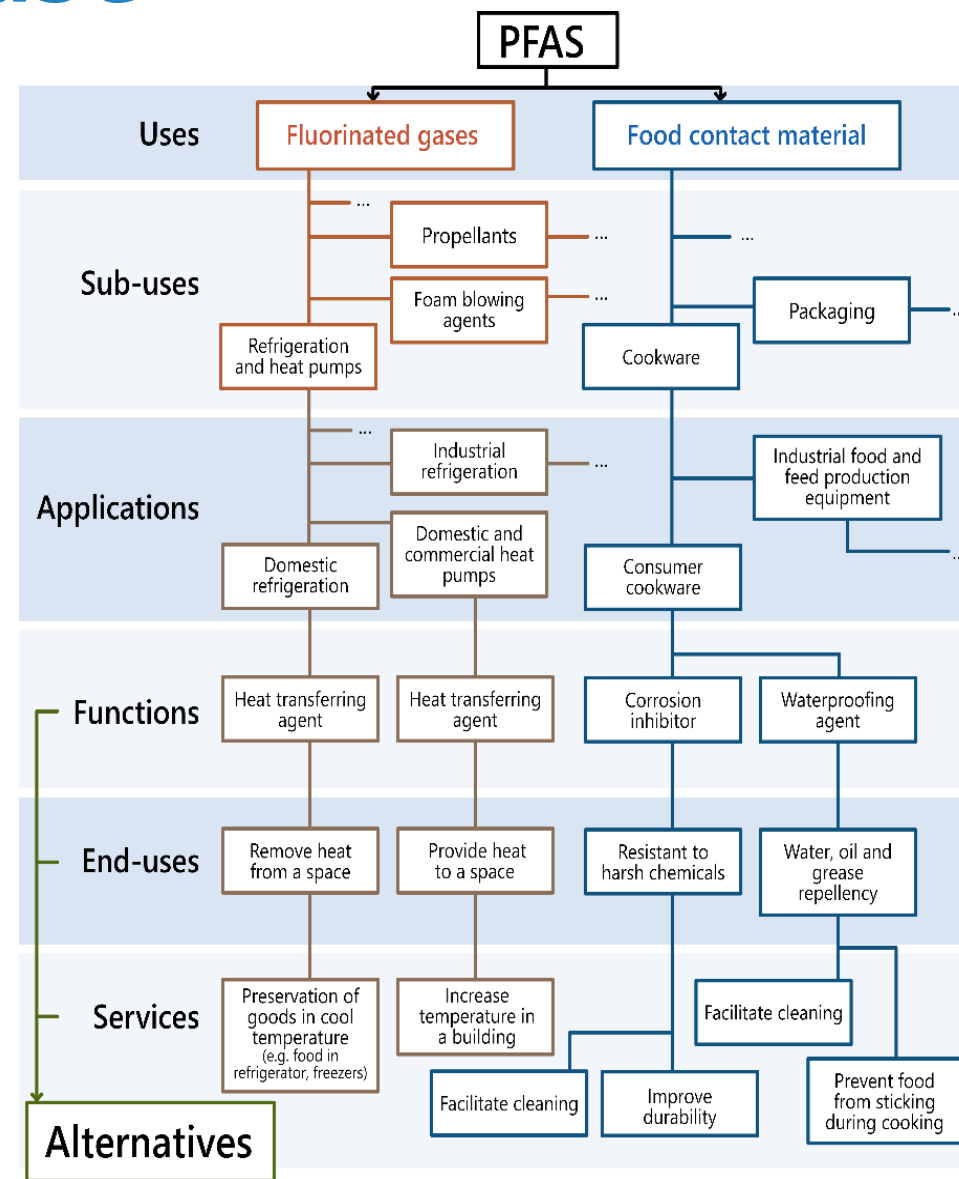
Uses and functions of PFAS

- 18 use categories of PFAS included in the database
- Waterproofing agent, heat stabilizer and corrosion inhibitor are the most common technical functions
- Mainly for enhancing durability

Use categories	Sub-uses	Applications	Technical functions	End-use functions	Services
Active pharmaceutical ingredients	2	13	1	24	21
Biocides	1	4	1	4	4
Building and construction products	9	17	14	18	30
Consumer mixtures	7	15	7	15	12
Cosmetic products	5	30	9	12	6
Electronics and semiconductors sector	3	28	17	22	37
Energy sector	9	19	17	19	24
Firefighting foams	1	5	1	1	3
Fluorinated gases	7	29	8	14	27
Food contact materials	2	4	4	4	9
Industrial production	8	28	12	18	11
Lubricants	3	27	11	13	19
Medical products	6	21	14	18	29
Metal plating and metal products manufacture	2	4	8	10	14
Petroleum and mining	2	8	10	13	15
Plant Protection Products	1	6	3	7	5
Textile, upholstery, leather, apparel, and carpets	7	18	11	15	21
Transport sector	10	27	16	24	45
Grand Total	80	274	39	131	201

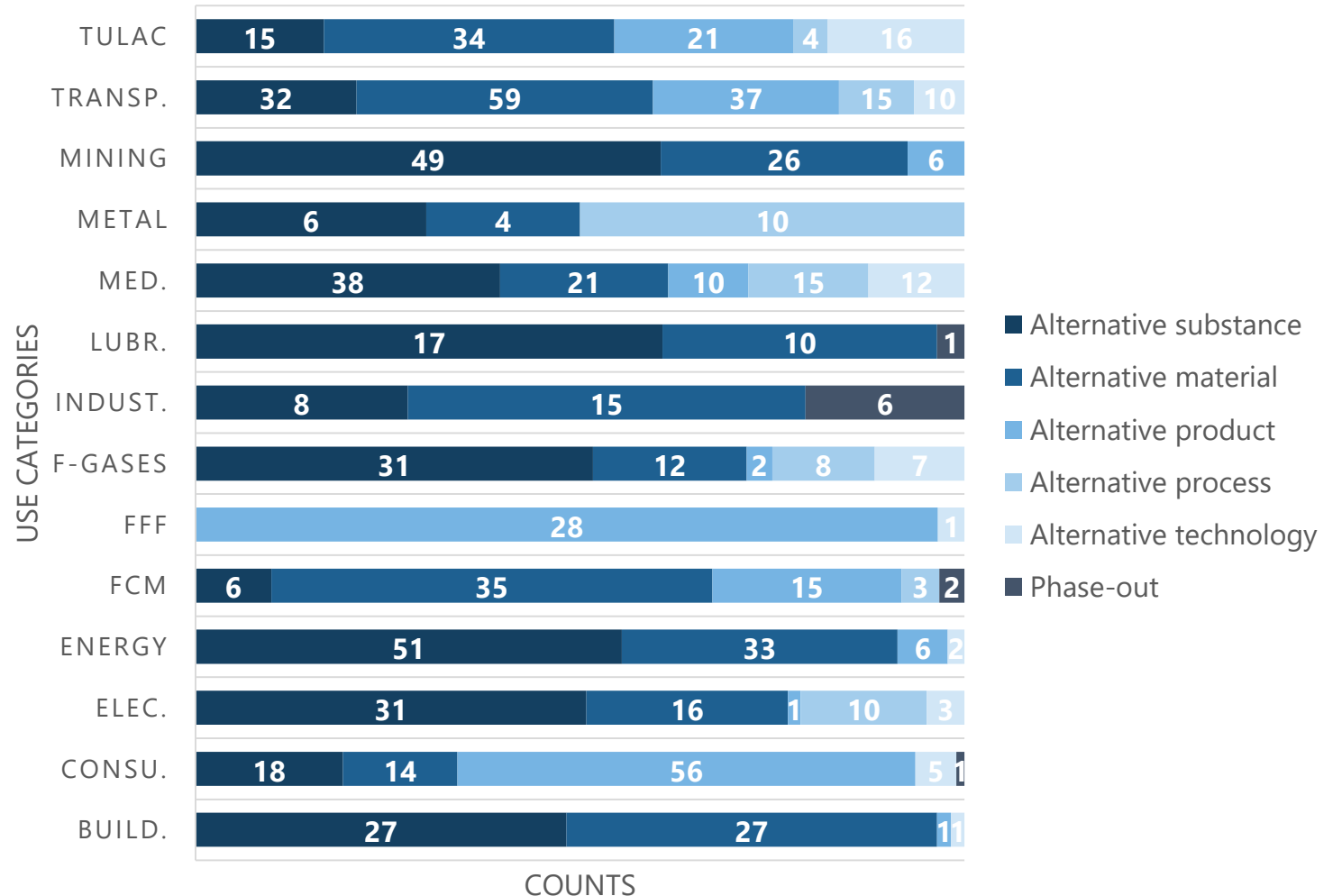
Overview of the database

- Alternatives identified based on the REACH restriction and ChemSec MarketPlace



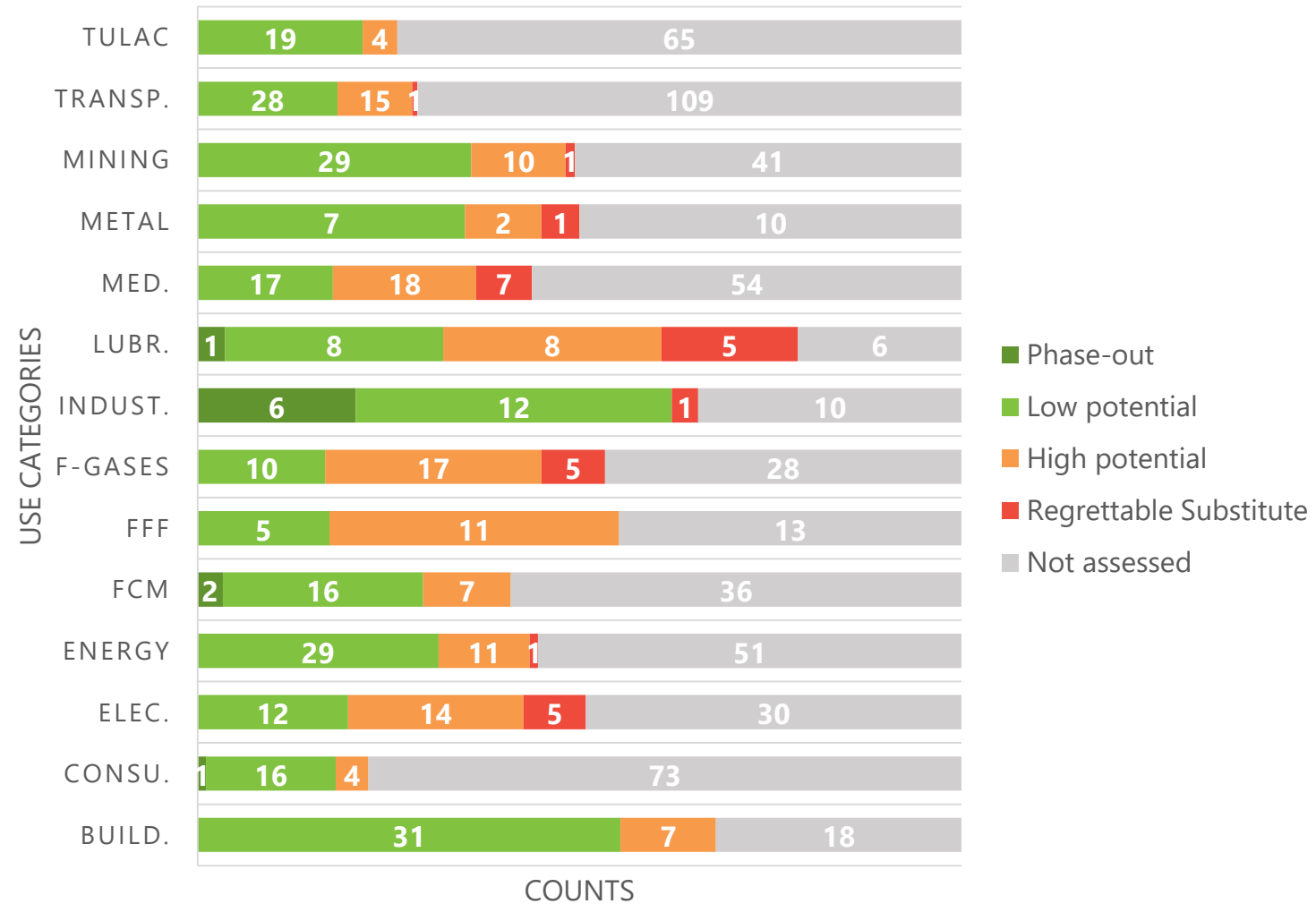
Number and types of alternatives to PFAS

- Database includes 532 different potential alternatives across 15 use categories
- No alternative found for 83 applications (mainly for industrial production)



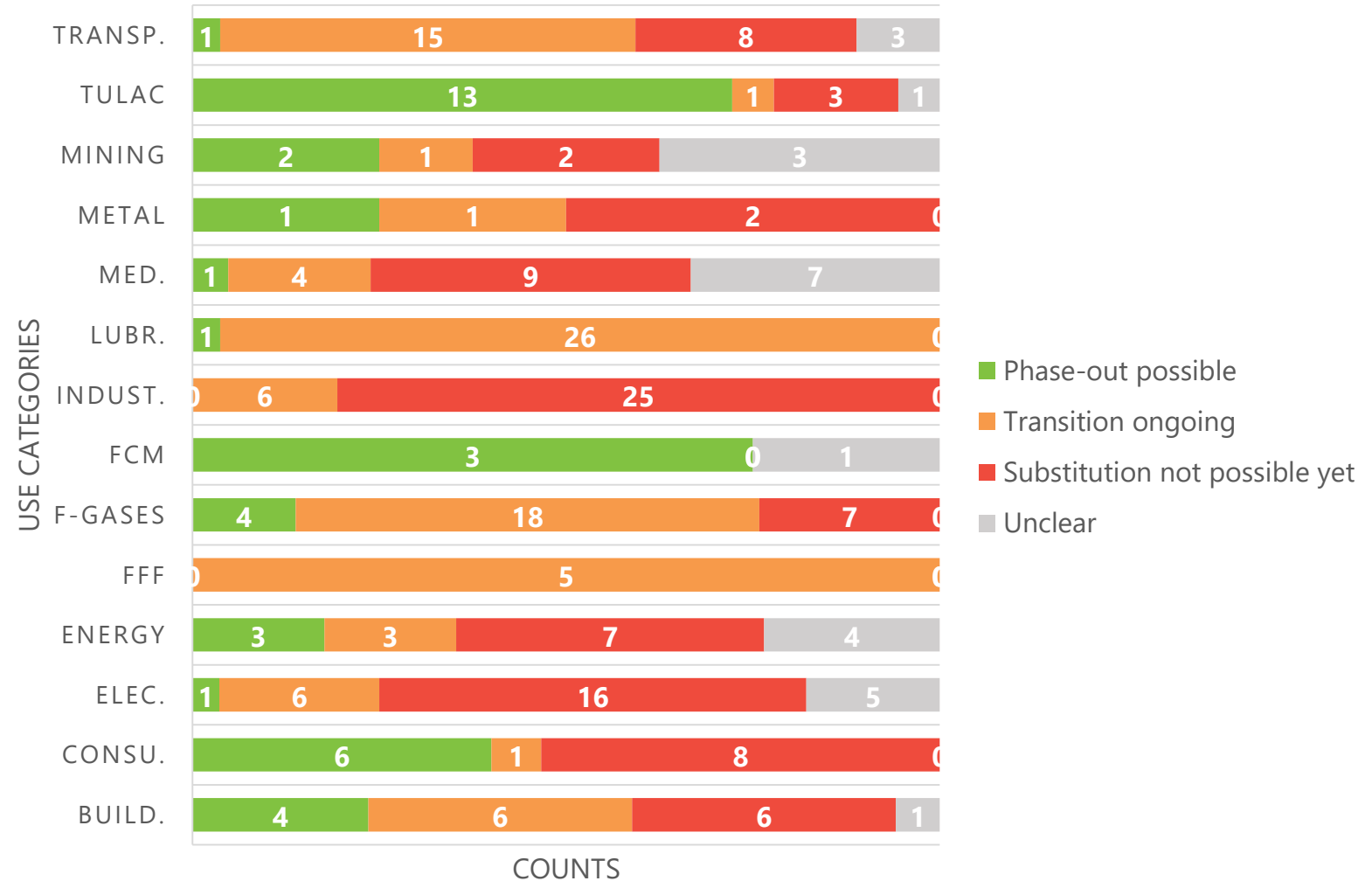
Safety of alternatives to PFAS

- Evaluation based on the Substitution Support Portal (https://www.subsportplus.eu/subsportplus/EN/Home/Home_node.html)
- Possible only for alternatives identified by a CAS number (i.e. 36%)



Are the alternatives suitable and available?

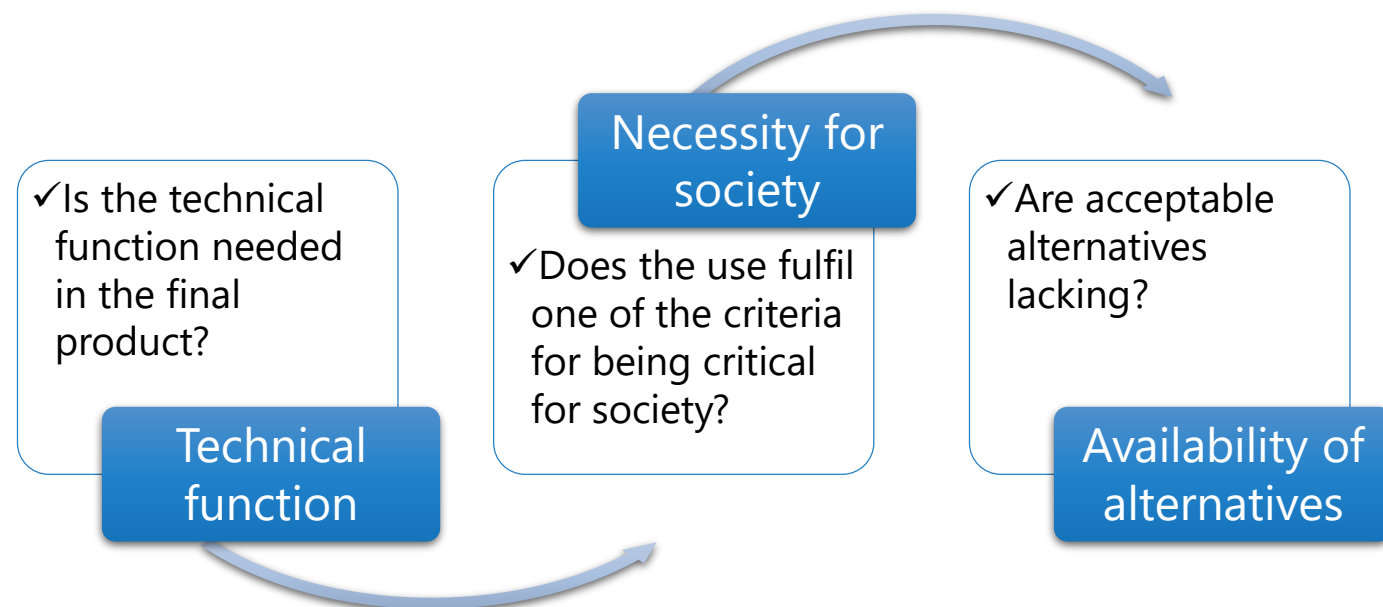
- Overall, no suitable alternatives available for ~25% of PFAS applications



Are uses of PFAS essential?

- Information in the database useful for evaluation of the need for the technical function
- **Based on availability of alternatives**, ~25% of uses of PFAS could be considered essential

Framework for assessment of essentiality



European Commission, 2024

https://environment.ec.europa.eu/publications/communication-essential-uses-chemicals_en

For more information



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**Access to the alternatives
database**





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