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Agenda item 5 (d)

Matters related to the implementation of the Convention: implementation plans

Draft guidance on preparing inventories of perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds

Note by the Secretariat

As is mentioned in the note by the Secretariat on the implementation plans (UNEP/POPS/COP.10/10), the annex to the present note sets out draft guidance on preparing inventories of perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds. The guidance also covers perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride. The present note, including its annex, has not been formally edited.

* In accordance with decisions BC-15/1, RC-10/2 and SC-10/2 of the conferences of the Parties to the Basel, Rotterdam and Stockholm conventions, the 2021/2022 meetings of the conferences of the Parties are being held in two segments: an online segment held from 26 to 30 July 2021 and a face-to-face segment to be held from 6 to 17 June 2022 in Geneva.

Annex

Draft guidance on preparing inventories of perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) and perfluorooctanoic acid (PFOA), its salts and PFOA related compounds listed under the Stockholm Convention

2021

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Abbreviations and acronyms

AFFF	aqueous film-forming foams
APFO	ammonium perfluorooctanoate
AR-AFFF	alcohol-resistant aqueous film-forming foams
AR-FFFP	alcohol-resistant film-forming fluoroprotein foams
BAT	best available technology
BEP	best environmental practices
BRS	Basel, Rotterdam and Stockholm conventions
CAS	Chemical Abstract Service
CCD	charge-coupled device (technology for capturing digital images)
ETFE	ethylene tetrafluoroethylene
EtFOSA	*N*-ethyl perfluorooctane sulfonamide (sulfluramid)
EtFOSE	*N*-ethyl perfluorooctane sulfonamidoethanol
diPAPs	fluorotelomer phosphate diesters
EU	European Union
FEP	fluorinated ethylene propylene
FFFP	film-forming fluoroprotein foams
FOSA	n-alkyl perfluorooctanesulfonamide
FOSE	n-alkyl perfluorooctanesulfonamido ethanol
FTSAs	fluorotelomer sulfonic acids
HS	Harmonized System
FTEOs	Fluorotelomer ethoxylates
LCD	liquid crystal display
NaPFO	Sodium Perfluorooctanoate
NIP	national implementation plan
OECD	Organization for Economic Cooperation and Development
PFA	perfluoroalkoxy alkane
PFAAs	perfluoroalkyl acids
PFAIs	Perfluoroalkyl iodides
PFAS	perfluoroalkyl and polyfluoroalkyl substances
PFCs	perfluorinated chemicals
PFCA	perfluoroalkyl carboxylic acid
PFOA	perfluorooctanoic acid
PFOB	Perfluorooctyl bromide
PFOI	perfluorooctyl iodide
PFOS	perfluorooctane sulfonic acid
PFOSA	Perfluorooctane sulfonamide
PFOSF	perfluorooctane sulfonyl fluoride
PFPiAs	Perfluoroalkyl phosphinic acids
POPs	persistent organic pollutants
POPRC	Persistent Organic Pollutants Review Committee
PTFE	polytetrafluoroethylene
PFA	perfluoroalkoxy alkane
PVDF	polyvinylidene fluoride
UNEP	United Nations Environment Organization
wt %	weight percent

1 Introduction

A POPs inventory is a compilation of information on past and present production and uses of a chemical listed in the Stockholm Convention on Persistent Organic Pollutants (POPs) in the country (UNEP, 2020a). The present document provides step by step guidance to prepare inventories of perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) and perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds listed under the Stockholm Convention.

PFOS, PFOA and their related compounds belong to the class of per- and polyfluoroalkyl substances, which are abbreviated as "PFASs" (Buck et al., 2011). Since the 1940s, PFASs have been widely used in various industrial and consumer products, such as fire-fighting foams, textile, leather, packaging, paper, and coatings (OECD, 2011). The extreme stability of perfluorinated carbon moiety prevent them from breaking down, and many PFASs are therefore persistent in the environment. Releases of PFAS to the environment have caused large-scale contamination in many countries, and severe and irreversible adverse effects on the environment and human health (ECHA, 2015a; Glüge et al., 2020). In comparison to other prior contaminants, PFAS are severely complicated by their mobility, high persistence, toxicological uncertainties, and technical obstacles to remediation (Simon et al., 2019). And it thus presents extreme complex challenges to the international community.

In 2009, the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants amended Annex B to the Convention to list PFOS, its salts and PFOS with specific exemptions and acceptable purposes (decision SC-4/17). In 2019, having considered the report on the assessment of alternatives to PFOS, its salts and PFOSF[1] and the report on the evaluation of PFOS, its salts and PFOSF,[2] the Conference of the Parties amended the acceptable purposes and specific exemptions for PFOS, its salts and PFOSF (decision SC-9/4). Furthermore, the Conference of the Parties listed PFOA, its salts and PFOA-related compounds in Annex A to the Convention (decision SC-9/12).

1.1 Substances covered in this document

In this document, the following definitions/classifications are used:

(a) PFOS, its salts and PFOSF are characterized by the C_8F_{17}-moiety directly attached to a sulfonyl or sulfonic acid group; they contain only C and F atoms in the perfluorinated carbon moiety;

(b) PFOA, its salts and PFOA-related compounds. PFOA-related compounds are any substances that degrade to PFOA, having a linear or branched perfluoroheptyl group with the moiety $(C_7F_{15})C$ as one of the structural elements.

The following compounds are not considered as PFOA-related compounds and thus are not included in the listing to the Stockholm Convention:

(a) C_8F_{17}-X, where X= F, Cl, Br;

(b) Fluoropolymers that are covered by $CF_3[CF_2]_n$-R', where R'=any group, n>16;

(c) Perfluoroalkyl carboxylic and phosphonic acids (including their salts, esters, halides and anhydrides) with ≥8 perfluorinated carbons;

(d) Perfluoroalkane sulfonic acids (PFSA, including their salts, esters, halides and anhydrides) with ≥9 perfluorinated carbons;

(e) PFOS, its salts and PFOSF, as listed in Annex B to the Convention.

Hereafter, PFOS, its salts, PFOSF, PFOA, its salts and PFOA-related compounds are referred to "the relevant chemicals of the document".

1.1.1 PFOS, its salts and PFOSF

PFOS ($C_8F_{17}SO_3H$) is a fully fluorinated (perfluorinated) alkane sulfonic acid (PFSA). PFOS anions most commonly exist as simple salts including potassium perfluorooctane sulfonate, lithium perfluorooctane sulfonate, and ammonium perfluorooctane sulfonate. The common PFOS salts are listed in Table 2. PFOSF is a raw material to produce "PFOS-related compounds" (UNEP, 2017b).

[1] UNEP/POPS/POPRC.14/INF/13.

[2] UNEP/POPS/COP.9/INF/12.

The term "PFOS-related compounds" does not appear in the listing for PFOS, its salts and PFOSF (for the exact wording, see decision SC-9/4, as reflected in Table 2 below). For practical reasons, in the guidance, the term "PFOS-related compounds" is used for all substances that contain one or more $C_8F_{17}SO_2$- groups, which can degrade to PFOS in the environment and biota.

The Organization for Economic Cooperation and Development (OECD) has compiled a Comprehensive Global Database of PFASs in 2018,[3] in which the PFOS-related compounds are those in the following "Structure Categories" with 8 or more perfluorinated carbons (Table 1). One will need to check the corresponding "Structure-Category" and "Perfluoroalkyl Chain Length" column in the Comprehensive Global Database of PFASs in order to filter PFOS, its salts, PFOSF and PFOS-related compounds.

Table 1: Structure categories which belong to PFOS, its salts, PFOSF, PFOS-related compounds in the OECD Comprehensive Global Database of PFASs.

Structure Category	Name
201	perfluoroalkane sulfonyl halides
202	perfluoroalkane sulfonic acids (PFSAs), their salts and esters
203	perfluoroalkane sulfonyl-based nonpolymers
203.01	perfluoroalkane sulfonyl amides/amido ethanols (xFASA/Es) and other alcohols
203.02	perfluoroalkane sulfonyl amido ethanols, phosphate esters (SAmPAPs)
203.03	perfluoroalkane sulfonyl (meth)acrylates
203.04	perfluoroalkane sulfonyl silanes
203.05	perfluoroalkane sulfonyl acetic acids & esters
204	perfluoroalkane sulfonyl-based side-chain fluorinated polymers
204.01	perfluoroalkane sulfonyl (meth)acrylate polymers
204.02	perfluoroalkane sulfonyl urethane polymers
204.03	perfluoroalkane sulfonyl siloxanes/silicon polymers

PFOS, its salts and PFOSF were listed in Annex B to the Stockholm Convention by decision SC-4/17 in 2009. By decision SC-9/4 in 2019, the Conference of the Parties decided to amend Annex B with regard to specific exemptions and acceptable purposes for PFOS, its salts and PFOSF, as reflected in Table 2 below. The amendment is based on that there is no longer any Party registration for specific exemptions for the production and use of PFOS, its salts and PFOSF for uses in carpets, leather and apparel, textiles and upholstery, paper and packaging, coatings and coating additives, and rubber and plastics. No new registrations may be made with respect to them.

These amendments entered into force on 3 December 2020, on expiry of one year from the date of communication by the depositary of the adoption of the amendment, for all Parties that have not submitted a notification of non-acceptance according to paragraph 3 (b) of Article 22. For those Parties that made a declaration pursuant to paragraph 4 of Article 25, the amendment will enter into force on the ninetieth day after deposit of its instrument of ratification, acceptance, approval or accession. Table 2 incorporates the amendments adopted by decision SC-9/12 in relation to PFOS, its salts and PFOSF regarding specific exemption.

[3] Comprehensive Global Database of PFASs: http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/.

Table 2: Listing of PFOS, its salts and PFOSF (SC-9/4) to the Stockholm Convention.

Chemical	Activity	Specific exemption
Perfluorooctane sulfonic acid (CAS No. 1763-23-1), its salts[a] and perfluorooctane sulfonyl fluoride (CAS No. 307-35-7) [a] For example: potassium perfluorooctane sulfonate (CAS No: 2795-39-3); lithium perfluorooctane sulfonate (CAS No: 29457-72-5); ammonium perfluorooctane sulfonate (CAS No: 29081-56-9); diethanolammonium perfluorooctane sulfonate (CAS No: 70225-14-8); tetraethylammonium perfluorooctane sulfonate (CAS No: 56773-42-3); didecyldimethylammonium perfluorooctane sulfonate (CAS No: 251099-16-8)	Production	**Acceptable purpose:** Production of other chemicals to be used solely for the uses below. Production for uses listed below. **Specific exemption:** None
	Use	**Acceptable purpose:** In accordance with part III of Annex UEP/SC-9/4 for the following acceptable purposes, or as an intermediate in the production of chemicals with the following acceptable purposes: • Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants *Atta spp.* and *Acromyrmex spp.* for agricultural use only **Specific exemption:** • Metal plating (hard-metal plating) only in closed-loop systems • Fire-fighting foam for liquid fuel vapour suppression and liquid fuel fires (Class B fires) in installed systems, including both mobile and fixed systems, in accordance with paragraph 10 of part III of Annex UNEP/SC-9/4

In accordance with paragraph 5 of part III of Annex B to the Convention, every four years, the Conference of the Parties evaluates the continued need for PFOS, its salts and PFOSF for the various acceptable purposes and specific exemptions on the basis of available scientific, technical, environmental and economic information.

Pursuant to the process set out in decision SC-6/4, the Persistent Organic Pollutants Review Committee (POPRC) prepares a report on the assessment of alternatives to PFOS, its salts and PFOSF and the Secretariat prepares a report on the evaluation of those chemicals based on the information provided by Parties, including information in their national reports.

Those reports prepared by the POPRC and the Secretariat also contain the latest information on the production and use of PFOS and its related chemicals. Please consult the following documents for the latest information available at the time of publication of this guidance. Chapter 3 of this document also summarizes the production and use of PFOS, its salts and PFOSF.

(a) Report on the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride UNEP/POPS/COP.9/INF/12) (UNEP, 2019c);

(b) Report on the assessment of alternatives to perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (UNEP/POPS/POPRC.14/INF/13) (UNEP, 2019b);

(c) Consolidated guidance on alternatives to perfluorooctane sulfonic acid (PFOS) and its related chemicals (UNEP/POPS/POPRC.12/INF/15/Rev.1) (UNEP, 2016a).

Information on the chemical properties, environmental fate, monitoring data, environmental and health risks of PFOS, its salts and PFOSF can be found in:

(a) Risk Profile of Perfluorooctane sulfonate (UNEP/POPS/POPRC.2/17/Add.5) (UNEP, 2006);

(b) Risk management evaluation on perfluorooctane sulfonate(UNEP/POPS/POPRC.3/20/Add.5) (UNEP, 2007);

(c) Addendum to the risk management evaluation for perfluorooctane sulfonate (UNEP/POPS/POPRC.4/15/Add.6) (UNEP, 2008).

1.1.2 PFOA, its salts and PFOA-related compounds

PFOA ($C_7F_{15}COOH$) is a fully fluorinated carboxylic acid (PFCA). PFOA salts include the PFOA anion, and ammonium, sodium or potassium as cations. CAS numbers also exist for the silver and chromium(III) salts (ECHA, 2015a).

PFOA-related compounds, for the purposes of the Stockholm Convention, are any substances that degrade to PFOA. This includes any substances (including salts and polymers) having a linear or branched perfluoroheptyl group with the moiety (C_7F_{15})C as one of the structural elements. It needs to be mentioned that some groups of substances are not included in the Stockholm Convention listing of PFOA, its salts and PFOA-related compounds (see Table 3).

Table 3: Listing of PFOA, its salts and PFOA-related compound to the Stockholm Convention (SC-9/12).

Chemical	Activity	Specific exemption
PFOA, its salts and PFOA-related compounds means the following: (i) Perfluorooctanoic acid (PFOA; CAS No. 335-67-1), including any of its branched isomers; (ii) Its salts; (iii) PFOA-related compounds which, for the purposes of the Convention, are any substances that degrade to PFOA, including any substances (including salts and polymers) having a linear or branched perfluoroheptyl group with the moiety (C_7F_{15})C as one of the structural elements; The following compounds are not included as PFOA-related compounds: (i) C_8F_{17}-X, where X= F, Cl, Br; (ii) Fluoropolymers that are covered by $CF_3[CF_2]_n$-R', where R'=any group, n>16; (iii) Perfluoroalkyl carboxylic and phosphonic acids (including their salts, esters, halides and anhydrides) with ≥8 perfluorinated carbons; (iv) Perfluoroalkane sulfonic acids (including their salts, esters, halides and anhydrides) with ≥9 perfluorinated carbons; (v) Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF), as listed in Annex B to the Convention.	Production	• Fire-fighting foam: None • For other production, as allowed for the Parties listed in the Register in accordance with the provisions of part X of this Annex

	Use	In accordance with the provisions of part X of this Annex:
		• Photolithography or etch processes in semiconductor manufacturing
		• Photographic coatings applied to films
		• Textiles for oil and water repellence for the protection of workers from dangerous liquids that comprise risks to their health and safety
		• Invasive and implantable medical devices
		• Fire-fighting foam for liquid fuel vapour suppression and liquid fuel fires (Class B fires) in installed systems, including both mobile and fixed systems, in accordance with paragraph 2 of part X of this Annex
		• Use of perfluorooctyl iodide for the production of perfluorooctyl bromide for the purpose of producing pharmaceutical products, in accordance with the provisions of paragraph 3 of part X of this Annex
		• Manufacture of polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) for the production of:
		  ○ High-performance, corrosion-resistant gas filter membranes, water filter membranes and membranes for medical textiles
		  ○ Industrial waste heat exchanger equipment
		  ○ Industrial sealants capable of preventing leakage of volatile organic compounds and PM2.5 particulates
		• Manufacture of polyfluoroethylene propylene (FEP) for the production of high-voltage electrical wire and cables for power transmission
		• Manufacture of fluoroelastomers for the production of O-rings, v-belts and plastic accessories for car interiors

OECD has compiled a Comprehensive Global Database of PFASs.[4] The PFOA-related chemicals are chemicals which have the "Structure Categories" in Table 4 with 7 or more perfluorinated carbons. One will need to check the corresponding "Structure-Category" and "Perfluoroalkyl Chain Length" column in the Comprehensive Global Database of PFASs in order to filter chemicals that belong to PFOA, its salts and PFOA-related compounds.

Examples of PFOA-related compounds are:

(a) Fluorotelomer alcohols (8:2 FTOHs);

(b) Fluorotelomer iodides (8:2 FTI);

(c) Fluorotelomer phosphate monoesters (mono-PAPs) and fluorotelomer phosphate diesters (diPAPs);

(d) Fluorotelomer acrylate (8:2-FTAC) and its methacrylic acid ester analog 8:2-FTMAC;

(e) Fluorotelomer ethoxylates (FTEOs);

(f) Fluorotelomer sulfonates (8:2 FTS).

Table 4: Structure categories which belong to PFOA-related compounds in the OECD Comprehensive Global Database of PFASs.

Structure Category	Name
101	perfluoroalkyl carbonyl halides
102	perfluoroalkyl carboxylic acids (PFCAs), their salts and esters
103	other perfluoroalkyl carbonyl-based nonpolymers
103.01	perfluoroalkyl carbonyl amides / amido ethanols and other alcohols
103.02	perfluoroalkyl carbonyl silanes
103.03	perfluoroalkyl carbonyl (meth)acrylate
104	other perfluoroalkyl carbonyl-based side-chain fluorinated polymers
104.01	perfluoroalkyl carbonyl (meth)acrylate polymers
303	perfluoroalkyl phosphinic acids (PFPiAs), their salts and esters
304	bis(perfluoroalkyl) phosphinyl-based nonpolymers
304.01	bis(perfluoroalkyl) phosphinyl amids (PFPiAMs)
401	perfluoroalkyl iodides (PFAIs)
402	n:2 fluorotelomer-based non-polymers
402.01	n:2 fluorotelomer iodides (n:2 FTIs)
402.02	n:2 fluorotelomer olefins (n:2 FTOs)
402.03	n:2 fluorotelomer alcohols (n:2 FTOHs) / thiols
402.04	n:2 fluorotelomer alcohol, phosphate esters (PAPs)
402.05	n:2 fluorotelomer-based silanes
402.06	n:2 fluorotelomer-based (meth)acrylate
402.07	n:2 fluorotelomer sulfonic acids (n:2 FTSAs)
402.08	n:2 fluorotelomer sulfonyl-based compounds
402.09	n:2 fluorotelomer phosphonic / phosphinic acids
402.1	n:2 FTOH ethoxylates
402.11	n:2 FT amine, amino & derivatives
402.12	n:2 FT-thiol derivatives

[4] Comprehensive Global Database of PFASs: http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/.

Structure Category	Name
402.5	n:2 fluorotelomer carboxylic acids (FTCAs)
402.51	n:3 acids
402.52	FTAL
403	n:2 fluorotelomer-based side-chain fluorinated polymers
403.01	n:2 fluorotelomer-based (meth)acrylate polymers
403.02	n:2 fluorotelomer-based urethane polymers
403.03	n:2 fluorotelomer-based siloxanes/silicon polymers
403.04	n:2 fluorotelomer-based sulfonyl (meth)acrylate polymers
405	n:1 fluorotelomer-based side-chain fluorinated polymers
405.01	n:1 fluorotelomer-based (meth)acrylic polymers
406	fluorotelomer epoxides and derivatives
406.01	fluorotelomer epoxides
406.02	fluorotelomer epoxides derivatives
601	perfluoroalkyl silanes
602	perfluoroalkyl alcohols
603	perfluoroalkyl alcohol-based side-chain fluorinated polymers
701	hydrofluorocarbons (HFCs), semifluorinated alkanes (SFAs) and their derivatives
701.1	HFCs and derivatives
701.2	SFAs and derivatives
702	hydrofluoroethers (HFEs) and derivatives
702.1	HFEs
702.2	HFE-based silanes
702.3	other HFE-based derivatives
703	hydrofluoroolefins (HFOs)
704	semi-fluorinated ketons
705	side-chain fluorinated aromatics

Please consult the following documents for the latest information available on the production, use and risk profile of PFOA, its salts and PFOA-related compounds at the time of publication of this guidance:

(a) Risk management evaluation on pentadecafluorooctanoic acid (CAS No: 335-67-1, PFOA, perfluorooctanoic acid), its salts and PFOA-related compounds (UNEP/POPS/POPRC.13/7/Add.2) (UNEP, 2017a);

(b) Addendum to the risk management evaluation on perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds (UNEP/POPS/POPRC.14/6/Add.2) (UNEP, 2018).

For more information on production and use of PFOA, its salts and PFOA-related compounds, see Chapter 3.

1.2 Purpose of this guidance document

The purpose of this document is to provide Parties with guidance on the establishment of inventories of (1) PFOS, its salts and PFOSF and (2) PFOA, its salts and PFOA-related compounds. The target audience includes national focal points of the Convention and those involved in the process of reviewing and updating their national implementation plans (NIPs), in particular the task teams and coordinators responsible for establishing the inventory.

In accordance with Article 7 of the Convention and following the decisions of the Conference of the Parties to list new POPs in the Convention, each Party shall review and update their NIP. The updated NIPs should be transmitted to the Conference of the Parties within two years of the date on which those amendments entered into force for the Party.

In accordance with Article 15 of the Convention, Parties are required to report to the Conference of the Parties on the measures they have taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. This information includes statistical data on each Party's total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data.

Article 6, paragraph 1 (a) of the Stockholm Convention requires each Party to develop appropriate strategies for the identification of products and articles in use and wastes consisting of, containing or contaminated with POPs. The identification of the use of the relevant chemicals in the document, and wastes containing those chemicals, is the starting point for their effective environmentally sound management. Information obtained through the inventories of PFOS, PFOA and their-related compounds may assist in meeting these obligations.

The information obtained through the establishment of the inventories of PFOS, PFOA and their related compounds would be reported pursuant to Article 15 in the appropriate reporting cycle.

1.3 Other guidance documents to be consulted

The users of this guidance should consult the General Guidance on POPs Inventory Development (UNEP, 2020a) and other guidance documents, available on the website of the Stockholm Convention,[5] to support the review and updating of national implementation plans. The following are of particular relevance:

(a) General Guidance on POPs Inventory Development (UNEP, 2020a);

(b) Report on the assessment of alternatives to perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (UNEP/POPS/POPRC.14/INF/13) (UNEP, 2019b);

(c) Guidance on best available techniques and best environmental practices for the use of perfluorooctane sulfonic acid (PFOS) and related chemicals listed under the Stockholm Convention on Persistent Organic Pollutants (UNEP, 2017b);

(d) Guidance on best available techniques and best environmental practices for the use of perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and their related compounds listed under the Stockholm Convention on Persistent Organic Pollutants (UNEP, 2020b).

Furthermore, the present document should be used in conjunction with documents developed under the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal" which provide guidance on the development of identification strategies and inventories in relation to POPs wastes, as follows:

(a) General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (UNEP, 2010);

(b) Technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) (UNEP, 2015);

(c) Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride and perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds (UNEP/CHW/POP-SIWG.4/4) (UNEP, 2020c);

(d) Methodological guide for the development of inventories of hazardous wastes and other wastes under the Basel Convention (UNEP, 2013).

[5] http://chm.pops.int/tabid/7730/Default.aspx.

1.4 Objectives of developing the inventory

The main objectives of the inventory are to obtain the information needed for important decisions related to the management of (1) PFOS, its salts and PFOSF and (2) PFOA, its salts and PFOA-related compounds and implementation of the obligations in the Stockholm Convention. More specifically, the objectives are to:

(a) Provide the basis for identification of the national priorities in the NIP (i.e. the quantities of the POP that are produced, used, stored as stockpiles, and generated as waste in the country, identify the important economic sectors and operators and the type of actions required for those sectors, estimate the capacities needed for implementation, identify sources that should be prioritised);

(b) Identify dispersive uses in open applications that might pose a risk to humans and the environment for prioritisation;

(c) Provide a basis for the evaluation whether the current national use, production, chemical and waste management meet the requirements of the Convention and identify areas where they do not;

(d) Provide information on the need for specific exemptions or acceptable purposes, if available;

(e) Support Article 15 reporting to the Convention;

(f) Identify the relevant stakeholders in the government, academia, industry, waste management, commerce, NGOs, etc.;

(g) Identify areas where financial or technical support are needed to fill in the information gaps in the inventory/fulfil the obligations of the Convention.

The information to be obtained for the inventory may include:

(a) Production amounts of PFOS, its salts and PFOSF and of PFOA, its salts and related compounds at the national level;

(b) Presence of products/articles consisting of, containing, or contaminated with the relevant chemicals of the document on the market and in service;

(c) Use, imports, and export of products/articles consisting of, containing, or contaminated with the relevant chemicals of the document;

(d) Stockpiles of the products/articles consisting of, containing, or contaminated with the relevant chemicals of the document;

(e) Disposal practices for products/articles containing the relevant chemicals of the document when they become wastes as well as the amount of wastes;

(f) Releases to the environment from point sources;

(g) Potential contaminated sites;

(h) Potential harmful exposure of humans and the environment.

The information collected through inventories may provide a basis for Parties to evaluate whether they comply with the obligations of the Convention with respect to the relevant chemicals of the document and identify areas where they need to develop effective strategies and action plans for managing these POPs in order to meet their obligations.

The inventory process is usually a recurrent process. In establishing the inventories of PFOS, PFOA and their related compounds for the first time, Parties can identify the resources and technical capacity needed to further improve the accuracy of the inventory.

2 How to prepare inventories of PFOS, PFOA and their related compounds

2.1 General guidance on POPs inventory development

This section describes the general process to be followed in making an inventory. In summary, the following steps should be taken.

Step 1: Initiating the inventory development process

Establishing a national inventory team

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2.2 Step 1: Initiating the inventory development process

Establishing a national inventory team

In the initialization process, Parties are advised to establish a multi-stakeholder national inventory team. The inventory team may consist of government agencies, academia, advisory bodies, industries, waste management, commerce, NGOs, etc. Special attention should be paid to ensure participation of local government and relevant industries. Official letters from the government may smooth the interview, questionnaire, and site visit processes. It is important to clearly define the responsibilities for the national inventory team in developing the inventory in order to streamline the work. The inventory team should cooperate with other inventory teams which are set up nationally under the Stockholm Convention.

Identifying relevant stakeholders

Based on the tentative information on production and use of the relevant chemicals in the country, the team should identify relevant stakeholders, who will be contacted for the information in the process. Potential sectors and stakeholders involved in the life cycle of the relevant chemicals of the document are listed in Table 5 below.

Defining the scope of the inventory

The inventory should always address the whole life cycle of the relevant chemicals of the document, addressing potential production or import, different industrial uses, stockpiles, as well as their service life and waste management. It should also be considered to what extent potential contaminated sites should be included in the workplan. Scope of the inventory and life cycle of the relevant chemicals of the document is displayed in Figure 1.

Developing a workplan

The national inventory team should develop a workplan for the inventory including: data collection methodologies to be used; activities needed; resource allocation including responsibility and budget; and timeline and milestones.

Contacting the stakeholders

Stakeholders will likely need to be contacted several times during the inventory process. It may be useful to contact them at the beginning of the inventory to inform them about its background and scope. This can give them a better understanding of the aim of the inventory and an opportunity to communicate their views and questions, and to identify more relevant stakeholders.

Table 5 is a detailed and comprehensive list of relevant stakeholders. For teams which conduct the inventory for the first time, it is recommended to get contacts with some high-level stakeholder at the beginning, such as relevant ministries, industry associations and research institutes, to get an insight in the boundary of the inventory.

For a general description of Step 1, please refer to Chapter 2.2 of the General guidance on POPs inventory development(UNEP, 2020a).

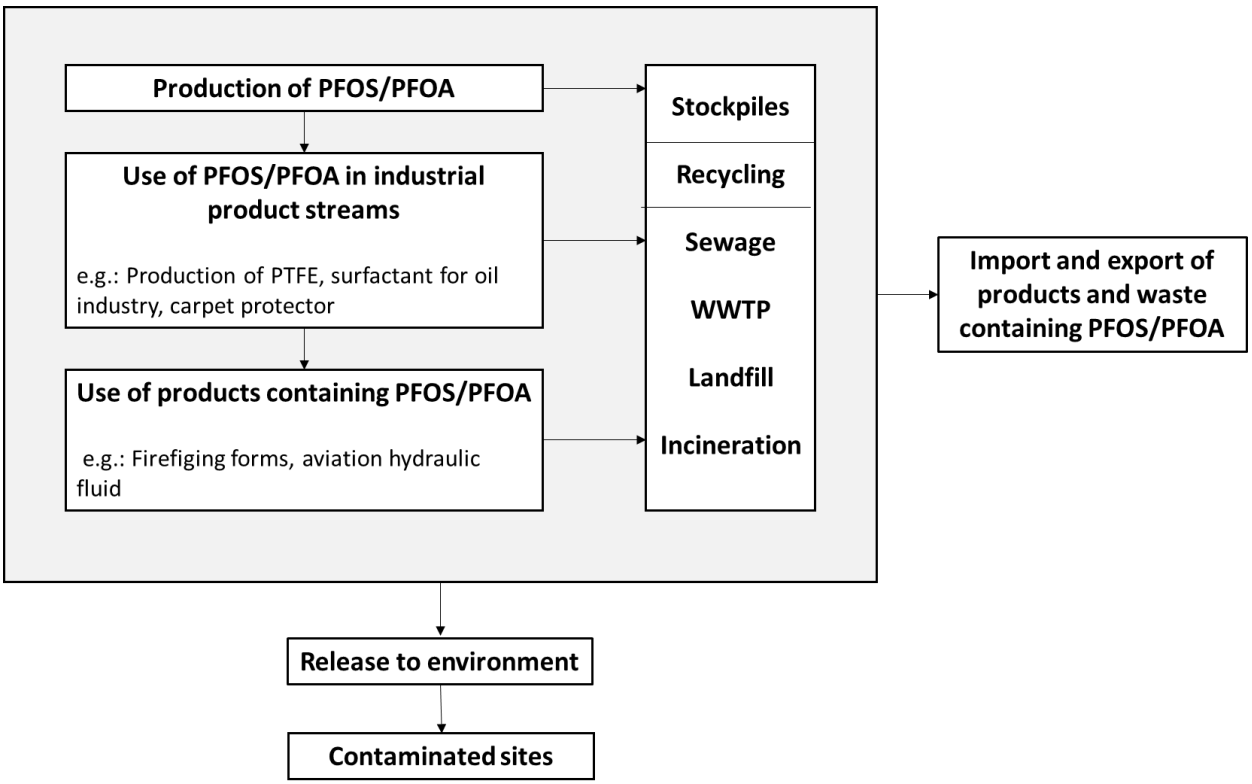


Figure 1: Scope of the inventories of PFOS, PFOA and their related compounds.

Table 5: Sectors and stakeholders involved in the life cycle of the relevant chemicals of the document.

Production and use	Stakeholder	PFOS- or PFOA-related
Ministries	• Ministry of Environment, and/or Ministry responsible for waste management • Ministry of Industry • Ministry of Labour • Ministry of statistic • Ministries responsible for chemicals management or the chemicals industry, that normally maintain a database or inventory of existing chemicals manufactured, imported or distributed in the country	Both
Customs	• Customs authorities (import and export)	Both
Research institutes and NGOs	• Research and educational institutions, including institutes and universities that conduct scientific research and technical development in organic chemistry, chemical process engineering, material science, and environmental engineering • NGOs related to POPs and PFASs	Both
Production, import, and export of the relevant compounds of the document	• Manufacturers of the relevant chemicals of the document • Manufacturers and suppliers of specific chemical formulars containing the relevant chemicals of the document. The related industries are described in Chapter 3.2 • Associations of the chemicals industry and of the polymer industry, and in particular associations of organic fluorine compound industry	Both
End-of-life treatment	• Wastewater treatment plants • Landfill facilities • Incineration facilities • Waste transfer stations • Waste management companies	Both
Recycling	• Recycling facilities (recycling of paper, packaging, carpet, textile, leather and apparel)	Both

Manufacture of polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) (using PFOA, its salts and related compounds)	• Manufacturers and suppliers of PTFE and PVDF
	• Manufacturers and suppliers of products containing PTFE and PVDF. Such applications include:
	  ○ High-performance, corrosion-resistant gas filter membranes, water filter membranes and membranes for medical textiles
	  ○ Industrial waste heat exchanger equipment
	  ○ Industrial sealants capable of preventing leakage of volatile organic compounds and PM2.5 particulates
	• Associations of membrane filtration, industrial sealants and heat exchanger.
		PFOA

Manufacture of polyfluoroethylene propylene (FEP) (using	• Manufacturers and suppliers of PEP • Manufacturers and suppliers of products containing FEP. Such applications include:	PFOA

Production and use	Stakeholder	PFOS- or PFOA-related
PFOA, its salts and related compounds)	○ High-voltage electrical wire ○ Cables for power transmission • Associations related to power transmission	
Manufacture of fluoroelastomers to produce O-rings, v-belts and plastic accessories for car interiors (using PFOA, its salts and related compounds)	• Manufacturers and suppliers of fluoroelastomers • Manufacturers and suppliers of products containing fluoroelastomers. Such applications include O-rings, v-belts and plastic accessories for car interiors • Associations of manufacturers and suppliers in the automotive industry	PFOA
Pharmaceutical industry (using PFOA, its salts and related compounds)	• Manufactures of certain pharmaceutical products, which uses perfluorooctyl iodide • Associations of pharmaceutical industry	PFOA
Fire-fighting foams	• Manufacturers of fire-fighting foams, and their associations • Local and regional suppliers of fire-fighting foams • Professional users of fire-fighting foams, including: ○ Offshore industry ○ Offshore installations ○ Oil refineries ○ Onshore gas terminals ○ Onshore oil and gas manufacturers and their installations ○ Petrochemical production and storage facilities ○ Chemical production and storage facilities ○ Airports ○ Military facilities ○ Shipping and ferry companies, railway companies ○ Fire and rescue brigades ○ Fire-fighting training sites ○ Car parks, underground parking facilities and tunnels ○ Tank farms and fuel storage facilities	Both
Medical devices	• Manufacturers and retailers of video endoscopes which contain CCD colour filters (PFOS-related) • Associations of video endoscopes (PFOS-related) • Manufacturers and suppliers of invasive and implantable medical devices containing PTFE (PFOA-related) • Association of invasive and implantable medical devices (PFOA-related)	Both
Textiles and apparel	• Manufacturers and suppliers of textile formulas, and their associations • Manufacturers and retailers of textiles, apparel, home furnishings, and their associations	Both
Leather and upholstery	• Manufacturers and suppliers of leather formulas, and their associations	Both

Production and use	Stakeholder	PFOS- or PFOA-related
	• Manufacturers and retailers of leather articles, leather apparel, leather upholstery, and their associations • Companies which provide leather and upholstery cleaning and caring services	
Synthetic carpets	• Manufacturers and suppliers of chemical formulas used for carpet impregnation/cleaning, and their associations • Manufacturers and retailers of synthetic carpets, and their associations • Companies which provide carpet cleaning and caring services	Both
Industrial and household products	• Manufacturers, suppliers and associations of chemical formulas including: o Impregnating agents used for carpet, textile, upholstery, leather and apparel o Cleaning and care agents used for carpet, textile, stone, etc. o Sealants and adhesive products • Retailers of the related industrial and household products, and their associations	Both
Paper and packaging	• Manufacturers of chemical formulas used in paper impregnation, and their associations • Manufacturers of treated paper, paperboards and packaging, and their associations • Food manufacturers, and their associations • Fast-food chains	Both
Insecticide: • Insect bait for leaf-cutting ants • Insecticide for fire ants and termites	• Manufacturers, chambers, importers and associations • Suppliers of insecticides, and their associations, including: o Agrochemicals importers o Dealers, wholesalers and retailers • Professional users: o Farmers and their associations o Larger plantations	Both
Coatings, coating additives and ink	• Manufacturers and suppliers of coatings, paint, varnishes, dye, and ink, and their associations • Manufacturers of chemical formulas used in coating, paint, varnishes, dye, and ink, and their association	Both
Photographic industry	• The photographic industry (photo imaging) and its associations • Manufacturers and suppliers of chemical formulas of photographic coatings applied to paper, film, and in printing plate	Both
Electronics and semiconductor industry	• The semiconductor industry and its associations • Manufacturers and suppliers of chemical formulas for the semiconductor industry for the following processes: o Etching o Dispersion o The desmear process	Both

Production and use	Stakeholder	PFOS- or PFOA-related
	○ Surface treatment ○ Photolithography ○ Photomicrolithography ○ Soldering, adhesive and painting	
Metal-plating industry • Hard chromium plating • Decorative chromium plating	• Metal-plating companies and industry associations • Manufacturers and suppliers of specific chemical formulars for plating applications • Research and educational institution in metal-plating • Departments of occupational health and environmental protection (especially at the local level), that can act as partners in data collection at chromium-plating plants • Consumer protection councils	PFOS
Chemically driven oil and gas production	• Manufacturers of agents used in oil and gas production • National associations for the petroleum industry • Oil and gas companies and service companies • Consumer protection councils • National environmental standards and regulations enforcement agencies • State environmental protection agencies • Manufacturers associations • Importers and suppliers of chemicals and reagents	PFOS
Mold release agent, in particular in the manufacturing process of rubber	• Manufacturers of fluorocarbon surfactants and mold release agent • Manufacturers that use mold release agents • Associations of rubber production	PFOS
Mining industry	• Mining and blasting industries • Geological and mining societies • Associations of miners • Raw materials research and development commissions • Small and medium enterprises development agencies • National environmental standards and regulations enforcement agencies	PFOS
Aviation hydraulic fluids	• Manufacturers of aviation hydraulic fluids, and their associations • Recyclers of aviation hydraulic fluids, and their associations • Local and regional suppliers of aviation hydraulic fluids • Professional users: ○ Airports ○ Military	PFOS

2.3 Step 2: Choosing data collection methodologies

Many different approaches have been used to gather information for POPs inventories, i.e., the indicative method (desk study of existing information), qualitative method (using interviews and questionaires), and quantitative method (collecting specific in-depth infomation from site visites and chemical analyses).

Collecting inventory-related data is a multi-step process that can be based on a tiered approach. This approach provides flexibility to Parties with varying priorities and capacities and allows for scaling of the work according to the findings. For a general description of tiered approach, please refer to Chapter 2.4 of the General guidance on POPs inventory development (UNEP, 2020a).

In the initial assessment phase (Tier I), desk studies are usually carried out, to gather information about existing, past and current national data on the production and use of the PFOS and PFOA, and on products/articles consisting of, containing or contaminated with these chemicals.

Questionnaires are valuable instruments for primary data collection in Tier II and Tier III phase. Based on consultation with stakeholders, questionnaires with explanatory notes can be developed and sent to the other relevant stakeholders to gather information. Model questionnaires for producers, users, seller and importer of the regulated chemicals as well as products containing the regulated chemicals are available in Appendices 3 to 12 to the present guidance and can be modified and adjusted as needed.

Samples of products and articles can be collected during on-site inspections at factories and markets, as well as in recycling locations and waste disposal/storage facilities. The samples can then be analysed to investigate the exact concentrations of the relevant chemicals of the document. Information on sampling and analysis of the relevant chemicals including international standards is compiled in the "Guidance on the sampling, screening and analysis of POPs in products and articles" (UNEP, 2017c).

Producers, suppliers, and users may be unaware that the relevant chemicals of the document are contained in the product. A producer may not be obliged to mention PFOS, PFOA and their related compounds in the material safety data sheet because of the low content in the product. Therefore, material safety data sheets are sometimes not reliable sources of information on the PFOS or PFOA content in products. As a result of these factors, direct measurement of samples is helpful to fill information gaps during the inventory process.

2.4 Step 3: Collecting and compiling data from different sectors

In general, the following information is sought for the inventory:

(a) **Industries** using or producing chemicals containing the relevant chemicals of the document;

(b) **Products and articles** containing the relevant chemicals of the document on the national consumer market;

(c) **Professional users** of articles or products containing the relevant chemicals of the document;

(d) **Import and export** of products/articles containing the relevant chemicals of the document;

(e) **Stockpiles** of products/articles containing the relevant chemicals of the document, and how they are managed;

(f) **Waste streams** of articles containing the relevant chemicals of the document and how they are managed;

(g) **Contaminated sites**.

2.4.1 Tier I: Initial assessment

An initial assessment (**Tier I**) is carried out to obtain an overview of the historical and current production, use, and disposal of the chemicals and refine the scope of the inventory.

During the Tier I assessment, the inventory team can screen the available literature and information from national statistic institution, published literature in scientific journals, commissioned research reports, technical reports or notes from industries, associations and organizations. The following documents provide the background information of related application and production of PFOS and PFOA.

(a) Chapter 3 of this guidance;

(b) Risk Profile of Perfluorooctane sulfonate (UNEP/POPS/POPRC.2/17/Add.5)(UNEP, 2006);

(c) Risk management evaluation on perfluorooctane sulfonate(UNEP/POPS/POPRC.3/20/Add.5) (UNEP, 2007);

(d) Addendum to the risk management evaluation for perfluorooctane sulfonate (UNEP/POPS/POPRC.4/15/Add.6) (UNEP, 2008);

(e) Risk management evaluation on pentadecafluorooctanoic acid (CAS No: 335-67-1, PFOA, perfluorooctanoic acid), its salts and PFOA-related compounds (UNEP/POPS/POPRC.13/7/Add.2) (UNEP, 2017a);

(f) Addendum to the risk management evaluation on perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds (UNEP/POPS/POPRC.14/6/Add.2) (UNEP, 2018).

In the next step, the inventory team should contact the major stakeholders (e.g., relevant ministries, large companies, industry associations) to obtain information on whether the relevant chemicals of the document were or are used/produced in the country. The ministry of environment and ministry in charge of industry, as well as the Stockholm Convention Regional Centre may have relevant information.

During data collection, the stakeholders' awareness of which PFOS- and PFOA-related compounds are regulated by the Stockholm Convention is crucial. Chapter 1.1.1 and 1.1.2 describe how to judge if a substance is PFOS- or PFOA-related.

Information on the import and export of the relevant chemicals of the document might be available at the customs service, industries using the chemicals or their related associations. When contacting the stakeholders, both current and historic import and export, as well as the related uses should be sought. Historical information can be used in the inventory sections such as waste streams, recycling and contaminated sites.

Harmonized System customs codes (HS codes) are used in import and export declaration. As PFOS, its salts, perfluorooctanesulfonamides (PFOSA) and perfluorooctanesulfonyls (PFOS-) are listed in Annex III to the Rotterdam Convention, these compounds were assigned HS codes (see Table 6). These HS codes can also be found at the UNEP website[6]. Moreover, some widely used fluoropolymers also have been assigned HS codes (see Table 6). In the meantime, more HS codes might have been assigned to the relevant chemicals of the document. The inventory team can consult the customs service for the updated HS codes.

Statistics on imports, manufacture and exports, can be used to calculate the estimated annual net consumption of the relevant chemicals of the document in the country (Equation 1). The concentrations of PFOS, PFOA, their salts and related compounds are listed in Table 7.

In order to ease the calculation process, it is not necessary to separate the sum of PFOS, its salts and PFOS-related compounds. The same applies to PFOA, its salts and PFOA-related compounds. Depending on the production process, the manufacture of the relevant chemicals of the document often ends up in mixtures instead of pure products. Some mixtures can be directly used in the downstream industries without purifying. It is only possible to have a clean cut between PFOS, its salts and related compounds when a lot of lab analysis and costs are involved. Moreover, the priority is to find out who is using the relevant chemicals and which applications are in the country. Based on the overview, effective actions to limit the pollution caused by PFOS and PFOA can be formulated. Therefore, lump sums of 1) PFOS, its salts and PFOS-related compounds, and 2) PFOA, its salts and PFOA-related compounds shall be calculated in Table 7.

Table 6: HS codes for PFOS, its salts, PFOS-related compounds and some fluoropolymers.

Chemicals	CAS number	HS Code (separate chemical[7])	HS Code (Mixture, preparations or articles containing the chemical)
Perfluorooctane sulfonic acid (PFOS), perfluorooctane sulfonates (its salts), perfluorooctane sulfonamides (PFOSA) and perfluorooctane sulfonyls (PFOS-) including:			3824.87
-PFOS	1763-23-1	2904.31	
-Potassium perfluorooctane sulfonate	2795-39-3	2904.34	
-Lithium perfluorooctane sulfonate	29457-72-5	2904.33	
-Ammonium perfluorooctane sulfonate	29081-56-9	2904.32	

[6]Harmonized System customs codes for chemicals listed in Annex III to the Rotterdam Convention. http://www.pic.int/TheConvention/Chemicals/HarmonizedSystemCodes/tabid/1159/Language/en-US/Default.aspx

[7] Codes for separate chemical elements and separate chemically defined compounds, where applicable. See Notes of Chapter 28 (Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes) and Chapter 29 (organic chemicals) of the HS for more details. Asbestos is classified in Chapter 25 (Salt; sulphur; earths and stone; plastering materials, lime and cement) and Chapter 68 (Articles of stone, plaster, cement, asbestos, mica or similar materials) of the HS. For a description of HS codes, consult the HS.

Chemicals	CAS number	HS Code (separate chemical[7])	HS Code (Mixture, preparations or articles containing the chemical)
-Diethanolammonium perfluorooctane sulfonate	70225-14-8	2922.16	
-Tetraethylammonium perfluorooctane sulfonate	56773-42-3	2923.30	
-Didecyldimethylammonium perfluorooctane sulfonate	251099-16-8	2923.40	
-N-Ethylperfluorooctane sulfonamide	4151-50-2	2935.20	
-N-Methylperfluorooctane sulfonamide	31506-32-8	2935.10	
-N-Ethyl-N-(2-hydroxyethyl) perfluorooctane sulfonamide	1691-99-2	2935.30	
-N-(2-Hydroxyethyl)-N-methylperfluorooctane sulfonamide	24448-09-7	2935.40	
-Perfluorooctane sulfonyl fluoride	307-35-7	2904.36	
Fluoropolymers including:			
Polytetrafluoroethylene (PTFE)		3904.6100	
Polymers of vinyl chloride or other halogenated olefins, or fluorinated polymers, in primary forms, (excl. Polytetrafluoroethylene)		3904.69	
Fluorelastomer FKM in primary form		3904.6920	

It also needs to be mentioned, that the calculation based on Equation 1 is only a rough estimation, as there are already fluorine-free alternatives in some of these products/materials. The assumption that all the relevant productions/materials contain PFOS/PFOA may be an overestimation. Moreover, the statistics on the manufacture of articles may not be detailed. The production statistics may not necessarily follow the same product codes as import and export. It is also expected that some statistical data on the manufacturing activities is confidential and not available. Therefore, the calculation based on statistics can be used as a reference value and must be carefully interpreted.

Annual net consumption of PFOS in [country] = [manufacture + import – export] of PFOS-containing products or articles x PFOS concentration Equation 1

Expected outputs of the Tier I: initial assessment include:

(a) A list of stakeholders;

(b) HS codes of the chemicals;

(c) Initial information on the production of the relevant chemicals in the country;

(d) Initial information on the uses of the relevant chemicals in the country;

(e) Initial information on the import and export of the relevant chemicals in and out of the country;

(f) Priority list of products and articles on the consumer market that may contain the relevant chemicals;

(g) Average service life of the products and articles identified as containing the relevant chemicals;

(h) Compilation of information as basis for Tier II assessment and initial feedback from stakeholders;

(i) A preliminary list of industries and other stakeholders having potentially used the relevant chemicals in the past and that might have generated waste and landfills and contaminated sites;

(j) Table 7 filled out.

Table 7: Template for calculations of annual net consumption of PFOS, PFOA, their salts and related compounds.

Category of article or preparation	Process steps, if applicable	Imports (per year)	Manufacture (per year)	Exports (per year)	Approx. PFOS content	PFOS quantity (kg per year)	Approx. PFOA content	PFOA quantity (kg per year)
PFOA, its salt, and related compounds,	Production, import, export.	(kg)	(kg)	(kg)	N/A	N/A	100%	
PFOS, its salts, and related compounds	Production, import, export.	(kg)	(kg)	(kg)	100%		N/A	N/A
Fluoro-polymer PTFE	Production	N/A	(kg)	N/A	N/A	N/A	APFO usage in PTFE production: 1100–4500 mg/kg PTFE	
Fluoro-polymer FEP	Production	N/A	(kg)	N/A	N/A	N/A	APFO usage in FEP production: 2300–8000 mg/kg FEP	
Fluoro-polymer PFA	Production	N/A	(kg)	N/A	N/A	N/A	APFO usage in PFA production: 2300–8000 mg/kg PFA	
Aqueous fluoro-polymer dispersion (PTFE, PEP and PFA)	Import and export	(kg)	N/A	(kg)	N/A	N/A	APFO concentration in dispersion: 1000 mg/kg	
Photo-graphic sector	Surfactant; Electro-static charge control agent; Friction control agent; Dirt repellent agent;	(m^2)	(m^2)	(m^2)	PFOS-related substance: 1-8 mg/m^2 film or paper		PFOA: 1-8 mg/m^2 film or paper	
Semi-conductor sector	Etching agent; Photoresist substance; Photo-acid generator; Surfactant; Anti-reflective coating agent.	0	Wastewater amount (m^3)	0	PFOS: 128.67 mg/m^3 wastewater		PFOA: 0.1183 mg/m^3 wastewater	

Category of article or preparation	Process steps, if applicable	Imports (per year)	Manufacture (per year)	Exports (per year)	Approx. PFOS content	PFOS quantity (kg per year)	Approx. PFOA content	PFOA quantity (kg per year)
Aviation hydraulic fluids		(kg)	(kg)	(kg)	PFOS: 500–1000 mg/kg		N/A	N/A
Fire-fighting foams (concentrate)		(L)	(L)	(L)	PFOS: 2400–11400 mg/L		PFOA: 240-1140 mg/L	
Metal plating	Mist suppressant; Surfactant.	Import of mist suppressant (PFOS concentration see product info)	Weight of used liquid in plating bath (kg)	Export of mist suppressant (PFOS concentration see product info)	PFOS-related substance in plating bath: 30000-70000 mg/kg		N/A	N/A
Medical devices, CCD filter		Number of CCD filter	Number of CCD filter	Number of CCD filter	PFOS: 0.0015 mg/CCD filter		N/A	N/A
Medical devices, implantable medical device made from PTFE		(kg)	(kg)	(kg)	N/A	N/A	PFOA: 1 mg/kg	
Insecticides		(kg)	(kg)	(kg)	PFOS-related substance: 100–1 000 mg/kg		PFOA: 14.5 mg/L	
Coating and impregnation of paper and packaging		Weight of paper (kg)	Weight of paper (kg)	Weight of paper (kg)	PFOS-related compounds: 1000–10000 mg/kg		PFOA-related compounds: 3000–10000 mg/kg	
Coating of textile, leather and apparel		(m^2) of textile, leather and apparel	(m^2) of textile, leather and apparel	(m^2) of textile, leather and apparel	PFOS: 0–0.01 mg/m^2		PFOA and PFOA-related compounds: 4×10^{-5}-0.05 mg/m^2	
Synthetic carpet		(kg) and (m^2)	(kg) and (m^2)	(kg) and (m^2)	N/A	N/A	PFOA: 3.5–226 mg/kg; 8:2 TFOH: 0.022–0.368 mg/m^2	
TOTAL quantity of PFOS/PFOA per year								

Source: The data in Table 7 are from the following literature: ABRAISCA (2016); Brooke et al. (2004a); ECHA (2015a); Fiedler et al. (2010); Dorte Herzke et al. (2012); Houtz et al. (2013); Kotthoff et al. (2015); Laitinen et al. (2014); Liu et al. (2014); Posner (2011); UNEP (2011, 2018); Z. Wang et al. (2014); Zangl et al. (2012); Jensen & Poulsen, (2008).

More detailed information on known concentrations of 1) PFOS, its salts and PFOSF and 2) PFOA, its salts and PFOA-related compounds in chemicals, articles and different industrial processes can be found in Chapter 3.2.

2.4.2 Tier II: Main inventory

It is likely that many questions remain open after the Tier I assessment and the main body of information for the inventory will be achieved in this phase. In Tier II, new and more detailed information is collected from the stakeholders through interviews, surveys and site visits. The focus of Tier II is the life cycle of the related chemicals of the document including their production, use, stockpile, import, export, and disposal in the country.

Questionnaire is a method of survey and can be used to collect information from the industry. The model questionnaires are listed in Appendices 3-12 and can be customised for individual use. In order to collect high quality data and ensure the data consistence, the inventory team may need to provide training on calculation on the chemical content and how to fill out the questionnaires. Direct contacts such as phone call and site visits are essential in order to collect the necessary data.

Expected outputs of the main inventory (Tier II) include:

(a) All major producers, users, importers and exporters approached, and questionnaires filled out with their responses;

(b) Information extraction from the production, use, stockpile, import, export and disposal of the relevant chemicals of the document, and products containing these chemicals;

(c) Information from relevant material safety data sheets (MSDS) assessed;

(d) Overview of domestic supply-chain networks;

(e) Data gaps where a Tier III inventory is needed;

(f) Additional stakeholders identified and contacted;

(g) Potentially contaminated sites identified;

(h) Compilation of information.

2.4.3 Tier III: In-depth inventory

In cases where Tier II approaches do not lead to satisfactory results, more information may be sought through Tier III: in-depth inventory. Tier III inventory could involve detailed site visits and analytical measurements of products or articles containing the relevant chemicals of the document.

A standardized method for analyses of PFASs in consumer articles has been described for national surveys (Dorte Herzke et al., 2009; US EPA, 2009; Vestergren et al., 2015). When using those methods, it is important to be aware that the content of the relevant chemical found in articles may not be the same as which applied during the manufacture.

Standard sampling and analytical procedures should be established and agreed upon before the start of a sampling campaign. The analytical methods and their limitations are described in the Guidance on sampling, screening and analysis of Persistent Organic Pollutants in products and articles (UNEP, 2017c).

Expected outputs of the in-depth inventory (Tier III) include:

(a) More detailed assessment of individual sectors including those where usage is minor;

(b) Clarification of the situation of individual facilities on their use pattern and waste management;

(c) Initial assessment of potential contaminated sites to decide on potential relevance.

2.5 Step 4: Managing and evaluating the data

The data need to be assessed for completeness and plausibility, possibly including a comparison with data from other countries in the region. Data gaps may (partly) be filled by extrapolation of available statistical data. If the quality of the data is considered unsatisfactory, additional data collection or screening (Tier III) should be undertaken.

For a general description of Step 4, please refer to Chapter 2.5 of the General guidance on POPs inventory development (UNEP, 2020a).

2.6 Step 5: Preparing the inventory report

The final stage of the inventory is preparation of the inventory report. This report includes results of inventories of all key sectors investigated by the country and is compiled in a single document.

The essential elements of the report are:

(a) Objectives and scope;

(b) Description of data methodologies used and how data were gathered, including all the assumptions and conversion factors adopted as a result of expert judgment;

(c) Final results of the inventory for each sector considered a priority for the country (using the format provided in this guidance or an adaptation of the same);

(d) Results of the gap analysis and limitations identified for completion of the inventory;

(e) Further action (such as stakeholder involvement, further development of data collection strategies, etc.) to be taken to complete the inventory and recommendations.

Other information (for example, a stakeholder list) could be included in the report depending on national preferences. The reporting format and compilation format are listed in Appendix 13 and Appendix 14.

3 Information on the relevant chemicals of the document

3.1 Production of the relevant chemicals of the document

3.1.1 Production of PFOS, its salts and PFOSF

PFOS, its salts and PFOS-related compounds have been manufactured for more than 50 years. They have been widely used in many applications and types of industries and are widely spread in the product chain. Some uses are in open applications with potential exposure of humans and the environment, while others are in closed, controlled systems. In 2000, 3M Company, historically the largest producer of PFOS products, reported global amounts per usage area (surface treatment, paper protection, and performance chemicals) as shown in Table 8. The company phased out production of all PFOS-related products in 2002. Under the condition of global elimination, alternatives to PFOS and is related compounds are studied. It is found that fluorinated or non-fluorinated alternatives exist for nearly all current uses. The guidance on alternatives to PFOS and is related compounds can be found on the website of Stockholm Convention[8].

Table 8: Global use of PFOS and its related chemicals.

Main category	Setting	Applications	Global usage before 2002[a] (metric tons)
Surface treatments	Industrial	Textile mills, leather tanneries, finishers, fibre producers, carpet manufacturers	2160
	Consumer or professional applicators of aftermarket treatment	Apparel and leather, upholstery, carpet, automobile interiors	
Paper protection	Paper mills	Food contact applications (plates, food containers, bags, and wraps), non-food contact applications (folding cartons, containers, carbonless forms, masking papers)	1490
Performance chemicals	Industrial, commercial, and consumer applications	Fire-fighting foams	151
		Mining and oil well surfactants, surfactant/wetting agent and mist suppressants for metal plating, electronic etching baths, photolithography, electronic chemicals, hydraulic fluid additives, alkaline cleaners, floor polishes, photographic film, denture cleaners, shampoos, chemical intermediates, coating additives, carpet spot cleaners, insecticide in bait stations	680

[a]Global usage amounts from 3M Company estimate (3M Company, 2000a)
Source: Lim et al., (2011).

In 2004, the annual use in the European Union (EU) was estimated at about 12 metric tons (Table 9). It was also estimated that a total of 122 metric tons of PFOS-based substances were maintained as fire-fighting foam stockpiles in the EU.

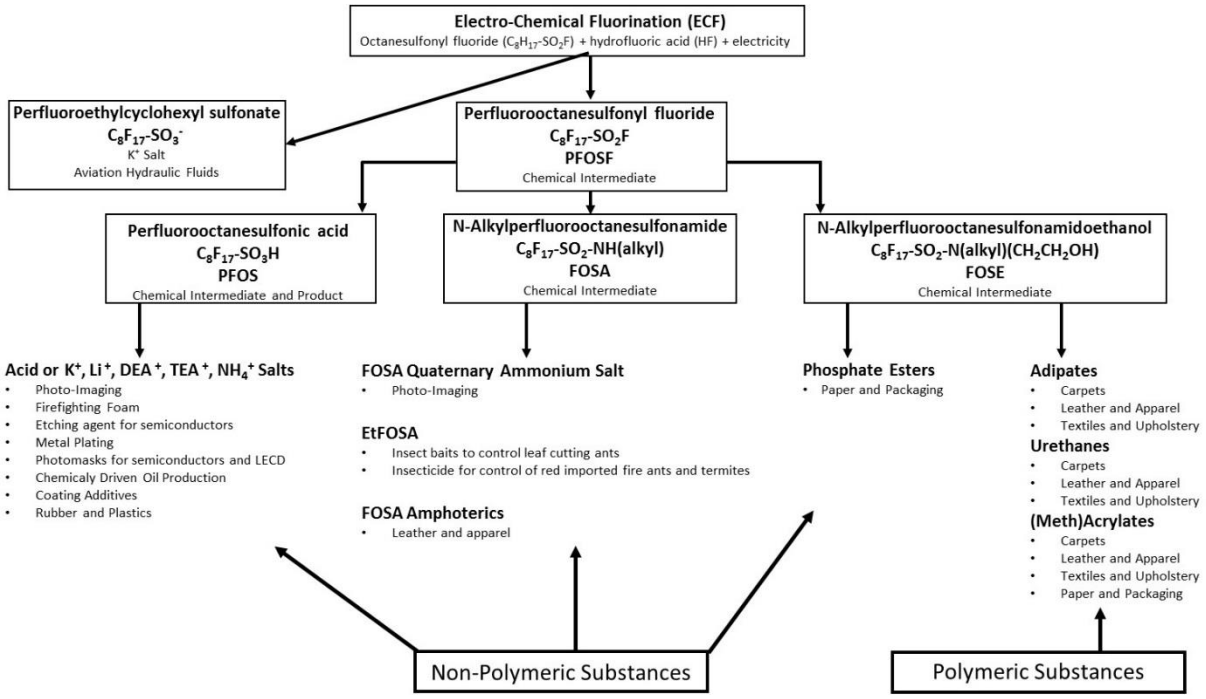
[8] Guidance on the alternatives to PFOS and its related compounds: http://chm.pops.int/Implementation/IndustrialPOPs/PFOS/Guidance/tabid/5225/Default.aspx.

Table 9: Estimated use of PFOS-related chemicals in the EU in 2004.

Industry sector	Applications	Metric tons/ year
Metal plating	Chromium plating Anodising and acid pickling	10 0.02-0.03
Photographic industry	Paper products, printing plates, film products	1
Semiconductor industry	Photoresist coatings, edge bead removers, top anti-reflective coatings, bottom anti-reflective coatings, developers (surfactant)	0.5
Aviation industry	Hydraulic fluids	0.73

Source: DEFRA, (2004).

PFOSF, which is the starting material for PFOS and other PFOS-related chemicals, is manufactured by using 1-octanesulfonyl fluoride and anhydrous hydrogen fluoride through an electrochemical fluorination (ECF) process (known as the Simons ECF process). Manufacturers use PFOSF or its secondary derivatives as the intermediates to produce PFOS and its related compounds. It has been estimated that more than 68000 metric tons of PFOSF have been produced between 1958 and 2015, and most of these occurred between 1958 and 2002 (Z. Wang et al., 2017). Therefore, a major effort which PFOS presents, is the management of the legacy left by historical production and usage. Figure 2 below describes the production of PFOSF and the major product categories of PFOS-related compounds and their applications. A more detailed synthesis process can be found in Appendix 2.



Source: *OECD (2002)*

Figure 2: Process scheme and major product categories and applications of PFOSF, PFOS and PFOS-related compounds, such as FOSA and FOSE and the non-polymeric and polymeric derivatives.

3.1.2 Production of PFOA, its salts and related compounds

PFOA, its salts and related compounds have been produced since the 1950s. The ammonium salt (APFO) and the sodium salt (NaPFO) are largely used as processing aids in the polymerization of certain fluoropolymer (e.g., PTFE,

FEP) (3M Company, 2000b; Prevedouros et al., 2006; Z. Wang et al., 2014). Z. Wang et al. (2014) has estimated that the global consumption of APFO/NaPFO for the production of fluoropolymers was approximately 600 - 4000 metric tons from 1951 to 2015.

PFAIs is a PFOA-related compound when they contain 7 or more perfluorinated carbons. They are used since 1961 to produce the so called fluorotelomer-based products, such as diPAPs, FTSA and FTEOs, which are widely used as surface treatment agents and fluorinated surfactants. The production of PFAI was estimated to be as high as 171000 metric tons from 1961 and 2015 (Z. Wang et al., 2014). Due to concerns about the impact of long-chain perfluoroalkyl acids (PFAAs), such as PFOA, on humans and the environment, PFOA and their precursors are being substituted in many applications by other substances (UNEP, 2017a). The alternatives include fluorinated short-chain substances and non-fluorinated substances (Z. Wang et al., 2014). Therefore, lots of efforts will be to manage the legacy left by historical production and usage.

3.1.2.1 Production of PFOA

PFOA has been manufactured by two synthesis routes, namely ECF of octanoic acid fluoride (OCF, $C_7H_{15}COF$), and oxidation of perfluorooctyl iodide (PFOI). Depending on the synthesis routes, the industrial production of PFOA can be divided into three periods (Z. Wang et al., 2014):

(a) 1951-1974: using ECF only;

(b) 1975-2002: using ECF mainly, with minor production using oxidation of PFOI;

(c) 2003-2015: using oxidation of PFOI mainly, with production using ECF ceasing in western countries and Japan but commencing and increasing in China.

Depending on the manufacturing process, technical PFOA (without extra purification) is typically either a mixture of PFOA with other PFCA homologue impurities (between C_4 and C_{14}; from ECF) or pure PFOA (>99%; from oxidation of PFOI), respectively (Buck et al., 2011; Prevedouros et al., 2006; Z. Wang et al., 2014).

3.1.2.2 Production of PFOA-related compounds from PFOA and its salts

Technical PFOA was either directly used or further processed to manufacture PFOA-based products (Z. Wang et al., 2014). Figure 3 describes the historical and current production of PFOA-base products.

APFO and the NaPFO were largely used as processing aids in the polymerization of certain fluoropolymer (e.g., PTFE, FEP) and fluoroelastomer (3M Company, 2000b; Prevedouros et al., 2006).

PFOA-based chromium complexes were used as oil- and water-repellent finishes for paper (e.g. FC-805, CAS No. 55801-89-3) and stain-repellent finishes for leather (e.g. FC-146, CAS No. 37317-76-3) (Bryce, 1964; Philips et al., 1957; Scherer, 1970), before POSF-based products were widely used.

PFOA-based acrylic ester polymers (like monomers: L-9186, CAS No. 307-98-2; and L 9187, CAS No. 3934-23-4) were applied as oil- and water-repellent finishes for textile(Bryce, 1964; Holzapfel, 1966; Scherer, 1970), and as coatings in electronics applications to provide a humidity barrier on printed circuit boards ad to secure silicone oil on precision bearings (3M Company, 2000b; Z. Wang et al., 2014).

PFOA-based surfactants, such as CAS Nos. 335-90-0, 5158-52-1, and 802270-49-1, were used as ingredients in the early generation(s) of aqueous film-forming foams (AFFFs)(Z. Wang et al., 2014).

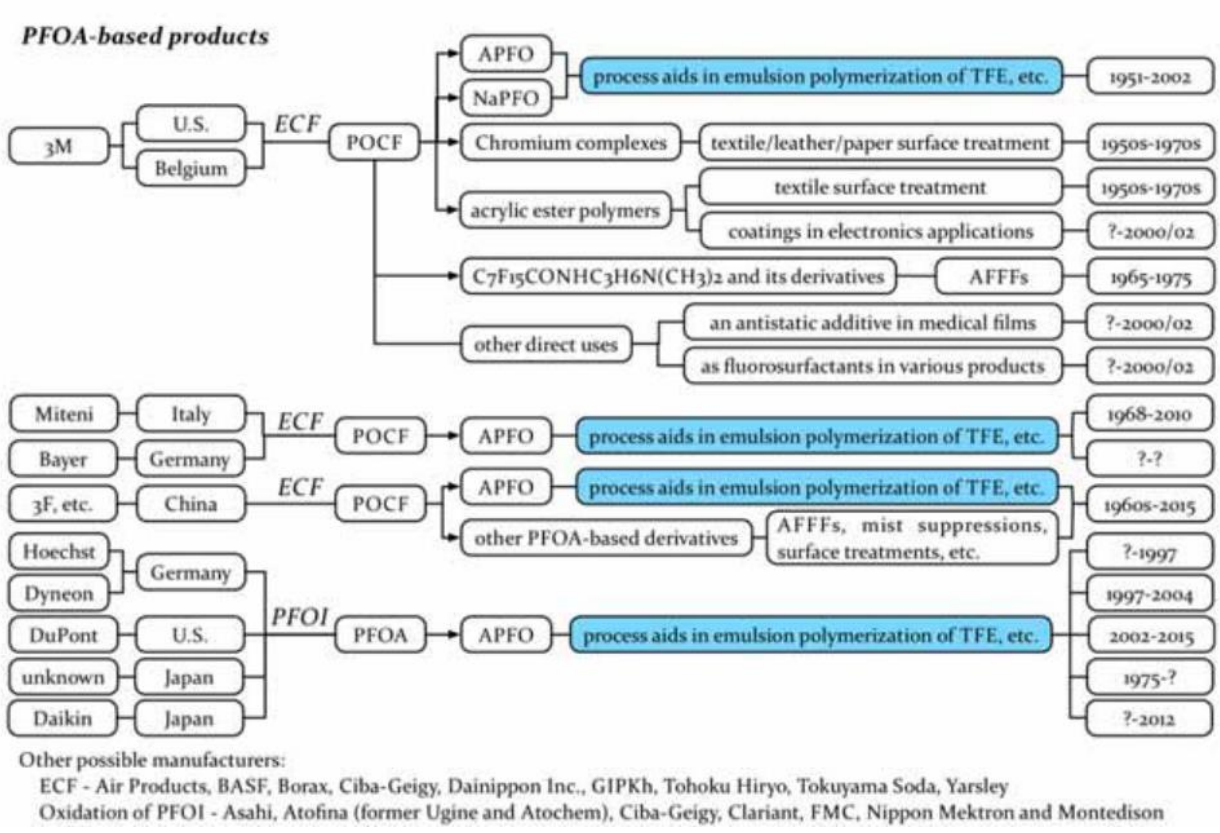
PFOA was also directly used as an antistatic additive that is coated in some medical film applications , and a surfactant in various products (e.g. in cleaning formulas) (OECD, 2006; Scherer, 1970).

3.1.2.3 Production of PFOA-related compounds from fluorotelomer

PFAIs are often converted by free-radical ethylenation to fluorotelomer iodides (FTIs), which can be further processed with various reactions to manufacture so-called fluorotelomer-based products (see Source: *Z. Wang et al. (2020)*

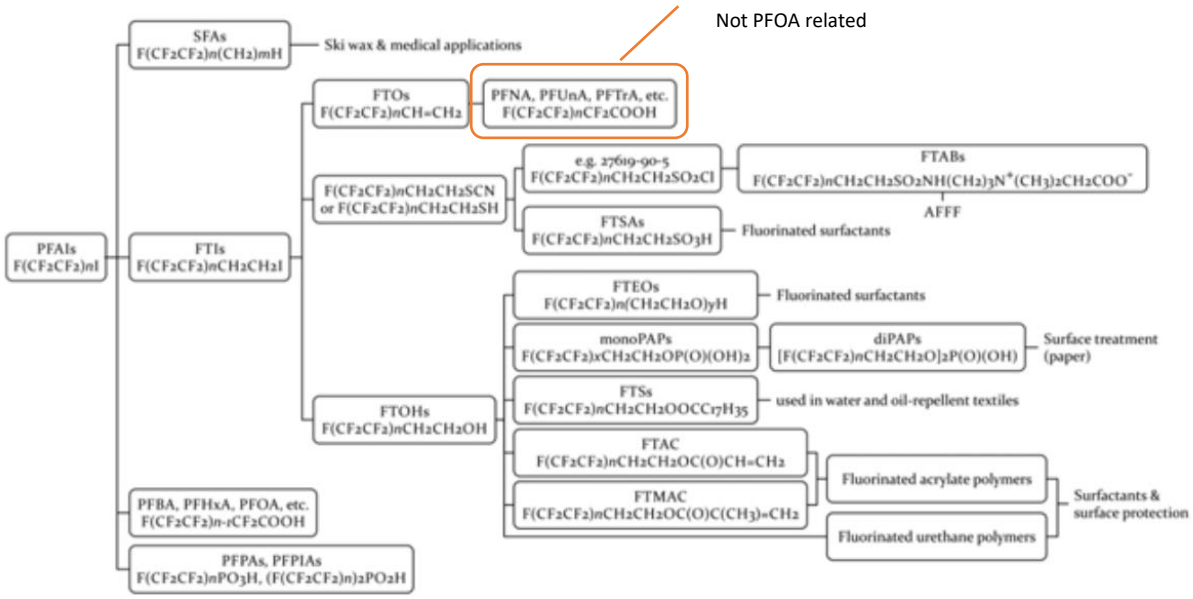
Figure 4). Except for the Products PFNA, PFUnA, PFTrA are not PFOA-related, all the other compounds in Source: *Z. Wang et al. (2020)*

Figure 4 are PFOA-related compounds when they contain 7 or more perfluorinated carbon. However, PFNA, PFUnA, and PFTrA can also contain impurity of PFOA-related compounds.



Source: *Z. Wang et al. (2020)*

Figure 3: Historical and current production and identified uses of known PFOA-based products.



Source: *Z. Wang et al. (2020)*

Figure 4: Synthesis scheme of some common fluorotelomer-based products and their major use.

3.2 Uses of the relevant chemicals of the document

3.2.1 General information on uses

PFOS

Due to the hydrophobic and hydrophilic nature, PFOS and many of its related compounds can be used as surface-active agents in a wide variety of applications. The chemical stability of these substances makes them suitable candidates for applications at high temperatures or environments with strong acids or bases. The strong chemical carbon-fluorine bond is the reason for the high persistence of perfluorinated substances. The historical use of PFOS-related compounds in the following applications has been confirmed in the US and the EU: fire-fighting foams, metal plating, surface treatment agents (e.g. for carpets, leather/apparel, textiles, upholstery, paper and packaging), coatings and coating additives; industrial and household cleaning products, biocides, etc. (UNEP, 2006).

PFOA

PFOA, its salts and PFOA-related compounds have unique properties such as high friction resistance, dielectrical properties, resistance to heat and chemical agents, low surface energy, and are water, grease, oil and soil repellent. Therefore, they are used in a wide variety of applications and consumer products across many sectors (UNEP, 2016b) (ECHA, 2015a). PFOA and its salts are, or were, most widely used as processing aids in the production of fluoropolymers, e.g. PTFE and specific fluoroelastomers. PFOA-related compounds, including side-chain fluorinated polymers, have been used as surfactants and surface treatment agents (e.g. in textiles, paper and paints, fire-fighting foams, etc.).

The specific application and uses of PFOS, PFOA, their salts and related compounds are described from Chapter 3.2.2 to Chapter 3.2.11.

3.2.2 Production of fluoropolymer

Information related to PFOS

Not relevant.

Information related to PFOA

The ammonium and sodium salts of PFOA (APFO and NaPFO) have been used as processing aids in the manufacturing process of several fluoropolymers such as PTFE, FEP (fluorinated ethylene propylene), PFA (perfluoroalkoxy alkane), PVDF (Polyvinylidene fluoride) or certain fluoroelastomers (ECHA, 2015a). The industry of fluoropolymer manufacture is the predominant global user of PFOA, although there is no current information on its share of total PFOA production available. In the year 2000, it was estimated that 85% of the total global use of PFOA was in fluoropolymer manufacturing (Prevedouros et al., 2006).

APFO/NaPFO used as processing aids are not consumed in the polymerization process and thus can be released into the environment along the production site. It has been estimated that 86% of the APFO/NaPFO used in the fluoropolymer production before 1963 were emitted into the environment as waste and the emission factor was between 70% and 80% since 1963 (Z. Wang et al., 2014).

Finished fluoropolymer products are in various forms such as granular, fine powder and aqueous dispersion. The APFO/NaPFO residuals in fine powder and granular are on the order of 1-10 ppm and thus negligible (Z. Wang et al., 2014). In contrast to solid products that have only trace level of APFO/NaPFO residuals, aqueous dispersion products contain a rather large amount of APFO/NaPFO residuals, from 400 ppm up to 7000 ppm, and typically less than 2000 ppm (Fluoropolymer Manufactures Group (FMG), 2003; Z. Wang et al., 2014). It is therefore important to collect information on the forms of the fluoropolymer during the inventory process.

Current situation related to PFOA

The exemptions of PFOA, its salts and related compounds in the production of fluoropolymer are granted to the uses listed in Table 10 at the COP meeting in May 2019. In the EU, PFOA, its salts and PFOA-related compounds are allowed in manufacture of PTFE and PVDF for specific applications until July 4, 2023 (REGULATION (EU) 2020/784, 2020).

Table 10: Exemption for the use of PFOA, its salts and related compounds in the production of fluoropolymer *(UNEP, 2019a)*.

PFOA substances	Specific exemptions
PFOA and its salts: • Ammonium salt of PFOA • Potassium salt of PFOA • Silver salt of PFOA • Sodium salt of PFOA PFOA, perfluorooctanoic acid	Manufacture of polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) for the production of: High-performance, corrosion-resistant gas filter membranes, water filter membranes and membranes for medical textiles Industrial waste heat exchanger equipment Industrial sealants capable of preventing leakage of volatile organic compounds and PM2.5 particulates
	Manufacture of polyfluoroethylene propylene (FEP) for the production of high-voltage electrical wire and cables for power transmission
	Manufacture of fluoroelastomers for the production of O-rings, v-belts and plastic accessories for car interiors

3.2.3 Pharmaceutical industry

Information related to PFOS

Not relevant.

Information related to PFOA

A PFOA-related substance, perfluorooctyl iodide (PFOI), is a common precursor in the manufacture of perfluorooctyl bromide (PFOB). PFOB is a processing aid in the manufacture of “microporous” particles for pharmaceutical applications. PFOB is not listed as a PFOA-related compound, only PFOI shall be calculated in the inventory of PFOA, its salts and related compounds. Except for the manufactory process, the PFOI contamination in PFOB shall also be considered.

Current situation related to PFOA

Parties to the Convention agreed on a specific exemption for use of PFOI used to produce pharmaceuticals. The exemption for PFOI will expire no later than 2036.

3.2.4 Electronics and semiconductor industry

Information related to PFOS

PFAS have been used in the electronics industry because they are water-repellent, have a low surface tension and high dielectric and breakdown strength (Banks et al., 1994). They have been used in the production of printed circuit boards, loud speakers, transductors, digital cameras, cell phones, printers, scanners, satellite communication systems, radar systems, and many other products(Glüge et al., 2020; KEMI, 2015; UNEP, 2019b).

Most of the uses of PFOS-related compounds in the electronics industry were closed-loop applications such as etching, dispersion, the desmear process, surface treatment, photolithography, and photomicrolithography, while applications such as soldering, adhesive and painting could be in open loop processes (Cheremisinoff, 2016). The PFOS-related compounds are process chemicals, and the final products are mostly PFOS-free.

In semiconductor industry, PFOS and its related compounds have been used in photolithography and etching process in manufacturing semiconductor chips (OECD, 2013). They can also be used as surfactants in the developer solution or used in ancillary products such as edge bead removers (Brooke et al., 2004).

Information related to PFOA

PFAS polymers employ properties such has high-temperature endurance, fire resistance, and high-stress crack resistance. PFOA-related polymers have been widely used in wires, cables, tapes, insulators, solder sleeves and vapor phase soldering media in the electronics industry (ECHA, 2015a; Glüge et al., 2020).

Like PFOS, PFOA and related compounds can be found in the semiconductor industry. They are contained in equipments used to manufacture semiconductors and are used in the photolithography and etching processes

during the semiconductor production (UNEP, 2017a). The specifications of use of PFOA, its salts or PFOA-related compounds in semiconductor industry are listed in Table 11.

Current situation related to PFOS

Parties to the Convention have eliminated all the acceptable purposes and specific exemptions for PFOS, its salts and related compounds in Photo masks in the electronics and semiconductor industry.

Current situation related to PFOA

Parties to the Convention agreed on a five-year exemption for the use of PFOA, its salts and related compounds in semiconductor manufacturing at the COP meeting in May 2019. In the EU, PFOA, its salts and PFOA-related compounds are allowed in photolithography or etch processes in semiconductor manufacturing until July 4th, 2025 (REGULATION (EU) 2020/784, 2020). Furthermore, an exemption of the use in the manufacture of FEP for the production of high-voltage electrical wires and cables for power transmission was granted at the COP 9 Meeting in May 2019.

Table 11: Specification of use of PFOS, its salts, PFOSF, PFOA, its salts or PFOA-related compounds in semiconductor industry.

Compounds	Use	Function
PFOS	Used in photolithography or etch processes in semiconductor device (microchips) manufacturing	Used as surfactant and as photoacid generator for photo-resistance, top anti-reflective coatings (TARCs), bottom anti-reflective coatings (BARCs) in photolithography (Brooke et al., 2004)
PFOA	Used in chemical-mechanical polishing slurries (ECHA, 2015a); Photolithography or etch processes	Used as surfactant

3.2.5 Photo-imaging

Information related to PFOS and PFOA

Both PFOS- and PFOA -related compounds have been used in photographic coatings applied to paper and in printing plates. These substances provide properties to control surface charge, surface tension, friction, and act as dirt repellant (Cheremisinoff, 2016). These properties have become even more important for state of the art materials that are more sensitive to light (e.g. faster film speeds), more sensitive diagnostic X-ray products, and for digital products that are processed dry and require the use of perfluorinated coating aids (Michiels, 2010).

Current situation related to PFOS

Parties to the Convention have eliminated the acceptable purpose for PFOS, its salts and related compounds in photo imaging.

Current situation related to PFOA

Parties to the Convention agreed on specific five-year exemptions for PFOA, its salts and related compounds used in photographic coatings on films at the COP meeting in May 2019. In the EU, PFOA, its salts and PFOA-related compounds are allowed in photographic coatings applied to films until July 4th, 2025 (REGULATION (EU) 2020/784, 2020). Table 12 list the uses, functions, and concentrations in different chemicals and products in photo imaging.

Table 12: Use, function, and concentrations of PFOS, its salts, PFOSF, PFOA, its salts and related compounds in different chemicals and products in photo imaging.

Compounds	Use	Function	Concentration
PFOS-related substance: N,N-dimethyl,3-perfluorooctylsulfonylpropyl-aminium, iodide.	used in coatings applied to photographic films, papers and printing plates; also used in	Surfactants Electrostatic charge control Friction control	PFOS-related substance: 0.1–0.8 µg/cm²(Brooke et al., 2004)

(CAS No. 1652-63-7); PFOS salt: Tetraethylammonium perfluoroalkane sulfonate (CAS No. 56773-42-3); Lithium perfluorooctane sulfonate (CAS No. 29457-72-5). Polymeric mixtures (not further specified) (UNEP, 2020c)	developing solutions in the past	Dirt repellent Adhesion control agents	
PFOA and PFOA-related substance such as APFO	Used in coatings applied to consumer and professional films (e.g. in x-ray photographic imaging)	Antistatic control Surface tension control; Friction control; Dirt-repellent	PFOA: 0.1–0.8 µg/cm² (ECHA, 2015a)

3.2.6 Metal plating

Information related to PFOS

PFOS-related chemicals have been used mainly as surfactants, wetting agents, and mist suppressants in hard and decorative chromium plating. These substances can be used to reduce the emission of chromium from the process and also improve the working environment. The harsh environment of the metal plating processes requires the surfactant to be stable in the presence of hot chromic acid and resist decomposition during the electrolysis. Perfluorinated surfactants, such as PFOS, demonstrate a good resistance, remain stable and maintains their activity over a long period (Posner, 2013).

Fluorosurfactants (including PFOS-related chemicals) were used in other metal-plating applications besides chromium plating. Their chemical stability allows to use them as agents to prevent haziness of plated copper by regulating foam and improving its stability, non-foaming surfactants in nickel-plating baths to reduce surface tension and agents added to tin-plating baths to ensure that plating has uniform thickness.

The PFOS-related compounds most commonly used in chromium plating were tetraethylammonium perfluorooctane sulfonate (CAS No. 56773-42-3, with trade names such as Fluorotenside-248, SurTec 960, FC-248 and FT-248m) and potassium perfluorooctane sulfonate (CAS No. 2795-39-3, with the trade name FC-80). Lithium, diethanolamine, and ammonium salts of PFOS may also be used for chromium plating (Cheremisinoff, 2016). New plating chemistry using chromium-III instead of chromium-VI is available for decorative chromium plating applications and has made PFOS-based fume suppressants in decorative chromium plating obsolete. PFOS typically remains in the chromium-plating solution after the metal-plating process.

Some of the PFOS-free alternatives in the market are FC-53 (potassium 1,1,2,2-tetrafluoro-2-(perfluorohexyloxy)ethane sulfonate), FC-53B (potassium 2-(6-chloro-1,1,2,2,3,3,4,4,5,5,6,6- dodecafluorohexyloxy)-1,1,2,2-tetrafluoroethane sulfonate) and Fumetrol® 21(1H,1H, 2H,2H-perfluorooctane sulfonic acid).

Information related to PFOA

Not relevant.

Current situation related to PFOS

With the decision SC-9/4, the Conference of the Parties agreed on the global exemption for the use of PFOS, its salts and PFOSF only for hard-metal plating in closed-loop systems. The exemption for PFOS, its salts and related compounds in decorative metal plating was eliminated. Table 13 summarizes the current exemptions for the metal plating processes.

Table 13: Use, function and concentrations of PFOS, PFOA and related compounds in metal plating.

Compounds	Use	Function	Concentration

Quaternary ammonium salt tetraethylammonium perfluorooctane sulfonate (trade name such as Fluorotenside-248 and SurTec 960); The potassium, lithium, diethanolamine and ammonium salts of perfluorooctane sulfonic acid	surfactant wetting agent mist suppressants	used to lower the surface tension of metal plating solutions to prevent the formation of mists containing potentially harmful components from the baths.	PFOS-related substance: 3-7% (UNEP, 2011)
PFOA, its salts and related compounds	Not relevant		

3.2.7 Fire-fighting foams

Aqueous film forming foams (AFFF) are used for Class B fire – flammable liquids, like oil, petrol, other non-water-soluble hydrocarbons and flammable water-soluble liquids like alcohols, acetone, etc. They are used at installations and plants where larger quantities of flammable liquids are stored.

Information related to PFOS

Fluorosurfactants are used in AFFF. Due to the extensive and dispersive mode of use, AFFF containing PFOS and PFOA have been the focus of attention. Over the past decades, AFFF manufacturers have been replacing PFOS-based products with fluorotelomer-based fluorosurfactants, often 6:2 ones.

However, significant amounts of AFFF containing PFOS may still be stored. AFFF have a long shelf life (10–20 years or longer), it is therefore possible that use of PFOS-containing fire-fighting foams may still be allowed. In addition, some regions have reported that fire-fighting foams with PFOS are still manufactured in large quantities. Identification of PFOS-containing foams by trade name may be impossible as the compositions of foams have changed over time, while the trade names have remained. Considering the long shelf-life of the foam concentrates, it may be useful to carry out an inventory even in countries that have phased out foams containing PFOS.

Information related to PFOA

AFFFs may also contain PFOA or PFOA-related compounds that have been used as surfactants (UNEP, 2017a). Prevedouros et al., (2006) reported that the concentrations of PFCAs within AFFF foams were between 0.1 and 1% wt/wt of the AFFF concentrate, with perfluorooctanoate (including APFO) making the largest proportion. R. Sontake & M.Wagh (2014) mentioned that AFFF concentrates were mixed with water at point of use, with typical application rates of 1, 3 or 6% wt/wt concentrate.

Although short-chain fluorinated foams already exist, impurities of PFOA and PFOA-related compounds seem to be a problem. The Swedish Chemicals Agency (2015) commented that residual concentrations of C8 substance, including PFOA and related substance, can be 0.01% wt/wt in the final commercial product (KEMI, 2015). In the EU, the REACH restriction allows for the presence of PFOA and PFOA-related compounds as by-products in fire-fighting foams placed in the EU market up to a maximum concentration of 25 ppb for PFOA or 1000 ppb or PFOA and PFOA-related compounds. Canada provides exemptions for trace quantities of PFOA within fluorotelomer-based AFFFs (UNEP, 2018).

Current situation related to PFOS

Decision SC.9/4 of the Conference of the Parties to the Stockholm Convention, adopted in May 2019, allows the use of PFOS and PFOS-related chemicals in fire-fighting foams as a specific exemption. The decision, however, also outlines specific conditions for such use, which should be taken into account.

Current situation related to PFOA

Parties to the Convention agreed on exemptions for PFOA, its salts and related compounds in usage of fire-fighting foams for liquid fuel vapor suppression and liquid fuel fires (Class B fires) in installed systems at the COP meeting in May 2019. Production of fire-fighting foams containing PFOA, its salts and related compounds is not allowed. In the EU, PFOA, its salts and PFOA-related compounds are allowed fire-fighting foams for Class B fires that are already

installed in systems subject to certain conditions until July 4, 2025 (REGULATION (EU) 2020/784, 2020). Table 14 summarized the PFASs concentration in AFFF concentrates.

Table 14: Concentrations of PFOS, its salts, PFOA, its salts and related compounds in the C8 AFFF concentrates.

Compounds	Use	Function	Concentration
PFOA and PFOA-related compounds	Film formers in AFFF; fuel repellents for fluoroprotein (FP) foam; stabilizers in resistant aqueous film-forming foam (AR-AFFF) and film forming fluoroprotein (FFFP)	surfactant	PFOA: 0.1-0.7 g/L (Fiedler et al., 2010; Houtz et al., 2013; Laitinen et al., 2014)
PFOS and PFOS-related compounds		Surfactant	PFOS: 2.4–11.4 g/L (Fiedler et al., 2010; Houtz et al., 2013; Laitinen et al., 2014)

3.2.8 Carpet, textile, leather and apparel

Information related to PFOS

PFOS- and PFOA-related chemicals have been used as formulars/mixtures for the oil-, water- and chemical-repellent finishing of textiles, leather, apparel, carpet and upholstery. Study shows that fibers from textile/fabrics which were coated with fluorinated polymer were released during washing (Schellenberger et al., 2019). Current understanding suggests that these fibers are source of contamination which reachs the environment either in effluent wastewater or sewage sludge applied to land (Schellenberger et al., 2019).

The main PFOS related compounds used for the surface treatment of textile and carpet were the acrylate, methacrylate, adipate and urethane polymers of N-ethyl perfluorooctane sulfonamidoethanol (EtFOSE)(UNEP, 2011). A restriction of use of PFOS and its related compounds in textiles was introduced after PFOS, its salts were listed in the Annex B of Stockholm Convention. As in other areas, PFOS and its related compounds are replaced by short-chain fluorinated compounds and other fluorine-free alternatives.

Information related to PFOA

PFOA and their related compounds have been found in the textiles which are water-, oil, and dirt-repellent. Textiles that are treated with PFASs are sources of human and environmental exposure. Robel et al. (2017) found that PFAS treated textile contained 0.1-2.5% unbound residues including volatile and ionic PFASs. It is also found that 8:2 FTOH, which is a precursor of PFOA, has been the dominant residues in the studied textiles (Robel et al., 2017). These unbound residues or impurity can be released to the environment via air and water during the use and waste phase of the treated textile.

Current situation related to PFOS

According to Decision SC-9/4, as there were no longer any Parties registered for specific exemptions for the production and use of PFOS, its salts and PFOFS for carpets, leather and apparel, textiles and upholstery, no new registrations may be made with respect to them. Parties to the Convention have eliminated the exemptions for PFOS, its salts and related compounds in carpet, textile and upholstery, leather and apparel.

Current situation related to PFOA

Parties to the Convention agreed on specific exemptions for PFOA, its salts and related compounds used in worker-protection textiles (5-year exemption) and medical textiles (no time limit) at the COP meeting in May 2019. For non-technical textiles used in outdoor applications (e.g. awnings and outdoor furnishing, camping gear), alternatives are available and an exemption is not justified.

In the EU, PFOA, its salts and PFOA-related compounds are allowed under certain concentration requirements for textiles for worker protection for dangerous liquids until July 4, 2023, listed in Table 15.

Table 15: Concentration of PFOS, its salts, PFOA, its salts and related compounds.

Compounds	Use	Function	Concentration
PFOS-related compounds: acrylate, methacrylate, adipate and urethane polymers of N-ethyl perfluorooctane sulfonamidoethanol (EtFOSE) (UNEP, 2011)	Surface treatment	Oil, water, dirt and grease repellent and stain release;	PFOS-related compounds: 1-2% (Posner, 2011)
PFOA-related compounds, such as side-chain fluorinated polymers, mainly copolymers of fluoroalkyl acrylates and methacrylate (Lacasse and Baumann, 2004)	Used in raw material for highly porous fabrics;Surface treatment in textile and leather articles such as sports and outdoor clothing, home textiles and upholstery, carpets, automotive and aviation industry, sun protection / building industry and lifting and carrying belts as well as in the professional sector, e.g. medical garments.	Oil, water, dirt and grease repellent and stain release; chemical resistance	See Table 16

Table 16: Use, function and concentration of PFOA in different textile, leather and apparel.

Compounds	Use	Function	Concentration
Outdoor clothing (Kotthoff et al., 2015)			
Outdoor clothing	PFOA-related	PFOA	median concentration: 6 µg/m² (max 41 µg/m²)
		8:2 TFOH	Median concentration: 44.2 µg/m² (max = 379.9 µg/m²)
Workers protection clothing (Zangl et al., 2012)			
protection clothing	PFOA-related	PFOA	<0.042 – 36.5 µg/m²
High visibility warning clothing	PFOA-related	PFOA	0.093 – 12 µg/m²
Cold protection clothing	PFOA-related	PFOA	< 0.081 - 5.85 µg/m²
Rain protection clothing	PFOA-related	PFOA	<0.04 – 1.25 µg/m²
Fleece products	PFOA-related	PFOA	< 0.053 – 21.3 µg/m²
Pilot clothing	PFOA-related	PFOA	0.056 – 5.77 µg/m²
Flame retardant clothing	PFOA-related	PFOA	< 0.048 – 1 µg/m²
Surgical clothing	PFOA-related	PFOA	< 0.04 - 0.246 µg/m²
Leather			
Leather	PFOA-related	PFOA	Maximal of 13 samples was 12.4 µg/m² (Kotthoff e al., 2015)
Carpet			
Pretreated/ Teflon® treated carpet	PFOA-related	PFOA	PFOA: 3.5 – 226 µg/g (Liu et al., 2014)
		8:2 TFOH	22 – 368 µg/m² (Dorte Herzke et al., 2012)
Impregnation spray (waterproof agent)			
Impregnation spray	PFOA-related	PFOA	median = 15.9 µg/kg (Kotthoff et al., 2015)
		8:2 FTOH	median = 146200 µg/kg (Kotthoff et al., 2015)

Compounds	Use	Function	Concentration
Cleaning agent (e.g. stone cleaner and sealer)			
Cleaning agent	PFOA-related	PFOA	median = 0.7 µg/kg (Kotthoff et al., 2015)
		8:2 FTOH	median = 63000 µg/kg (Kotthoff et al., 2015)

3.2.9 Biocide

Non-polymeric PFASs have been applied in biocides in two ways: (i) as active ingredients: e.g. short-chain PFAS-based sulfonamides in plant growth regulators or herbicides and N-ethyl perfluorooctane sulfonamide (also known as sulfluramid or sulfuramid) in ant baits to control leaf-cutting ants, red imported fire ants, and termites; (ii) as inert ingredients (enhancers) (OECD, 2013).

Information related to PFOS

N-Ethyl perfluorooctane sulfonamide (known as sulfluramid; EtFOSA; CAS No: 4151-50-2) is used as an active ingredient in ant baits to control leaf-cutting ants in many countries in South America as well as for control of red imported fire ants and termites (UNEP, 2011). Sulfluramid was used in insecticides at concentrations of 0.01-0.1% (ABRAISCA, 2016).

Sulfluramid is manufactured by using PFOSF as an intermediate and its structure is related to PFOS. In the environment, it degrades in significant yields to PFOS, although it also has the potential to degrade to PFOA under certain conditions. Since it is produced from PFOSF, it is already covered in the Stockholm Convention, although not mentioned explicitly, under the listing of PFOS, its salts and PFOSF. Therefore, a double listing under PFOA should be avoided (UNEP, 2018).

Fluorosurfactants may also be used as “inert” surfactants (enhancers used in pesticide formulars but not constituting active ingredients) in pesticide products (UNEP, 2017a).

Information related to PFOA

PFOA has also been used in pesticides mainly as inert ingredients. Fiedler et al. (2010) reported that PFOA concentration of one pesticide tested was 14,500 µg/L. Resent study from US EPA found that PFOA has been used in pesticide packaging. Investigation of US EPA showed that the HDPE containers of certain pesticide are treated inside and outside through fluorination, which resulted in PFASs including PFOA presence in the pesticide[9]. The concentration of PFOA was roughly 250 parts per trillion (ppt) and that of HFPO-DA (hexafluoropropylene oxide dimer acid, a “GenX” replacement for PFOA) ranged from 260 to 500 ppt. The contaminated pesticide has potentially spread over millions of acres. Therefore, in addition to the MSDSs of the pesticides, samples can be collected and analyzed to determine the exact concentrations of the related compounds of the document.

In certain pesticide, PFASs, such as PFPiAs (perfluoroalkyl phosphinic acids), have been used as anti-foaming agents in the solutions (Z. Wang et al., 2016). C_6/C_8 and C_8/C_8 PFPiAs are persistent and may transform into the highly persistent PFOA in the environment and are therefore counted as PFOA-related compounds (Lee et al., 2012; Z. Wang et al., 2016).

Current situation related to PFOS

The use sulfluramid as pesticide is currently not restricted. Its degradation products are PFOS-related compounds, and the use is intended to continue with no deadline for phaseout to control leaf-cutting ants *Atta spp.* and *Acromyrmex spp.*

Table 17: Use, function, and concentration of PFOS, PFOA and related compounds in pesticides.

Compounds	Use	Function	Concentration
Sulfluramid	For control of leaf-cutting ants *Atta spp.* and *Acromyrmex spp.* for agricultural use only	Active ingredient	0.01-0.1% (ABRAISCA, 2016)

[9]US EPA: https://www.epa.gov/pesticides/pfas-packaging.

PFOA, its salts and related sub. Non-polymer	Pesticide	Inert ingredients	PFOA concentration of 14,500 µg/L in one pesticide tested (Fiedler et al., 2010)

3.2.10 Medical devices

Information related to PFOS

PFOS, its salts and related compounds have been used in vitro diagnostic medical devices, such as video endoscopes, and CCD color filters. Video endoscopes are used to examine and treat patients at hospitals. Around 70% of the video endoscopes used worldwide contain a CCD43 color filter that contain PFOS concentrations of ca. 150 ng. Repairing such video endoscopes requires a CCD color filter containing PFOS. Although it is technically possible to produce PFOS-free CCD filters for use in new equipment, the existing 200,000 endoscopes that use PFOS-containing filters have an estimated amount of 0.03 g of PFOS. Gradual phase-out of the existing endoscopes will permit the use of PFOS-free equipment (UNEP, 2011).

PFOS was also used as an effective dispersant when contrast agents were incorporated into an ethylene tetrafluoroethylene (ETFE) copolymer layer. PFOS played an essential role in radio-opaque ETFE production, allowing the achievement of the levels of accuracy and precision required in medical devices (e.g. radio-opaque catheters such as catheters for angiography and in-dwelling needle catheters). PFOS was used as an agent in the manufacturing process and not be a part of the final product as a result of this use (UNEP, 2011).

Information related to PFOA

MedTech Europe (2018) provided detailed information stating that PFOA and PFOA-related compounds are used within medical settings as both non-polymeric substances and side-chain fluorinated polymers (including PTFE) (UNEP, 2018). MedTech (2018) noted that based on a survey of their members the presence of PFOA and PFOA-related compounds within medical devices will be present as a by-product of PTFE manufacture, where PFOA is used as an emulsifier. The use of PTFE within medical devices is selected based on its chemical resistance, heat resistance, lubrication and biocompatibility. However, it is also important to recognize that alternatives to the use of PFOA within PTFE, and PFOA-free PTFE products have been developed and have passed regulatory tests for commercialization in some geographies (UNEP, 2018).

A report by ECHA, (2015b) as part of the European restriction estimated European usage of PFOA within medical devices as <1kg per year. An extrapolation from the EU estimates would result in a corresponding global usage of <5kg per year based on a 20% global market share (UNEP, 2018).

3.2.10.1 Implantable medical devices

Implantable medical devices, which may be manufactured with PTFE containing PFOA can include, but are not limited to, synthetic vascular grafts, endovascular and interventional devices, surgical meshes for hernia repair, to sutures for use in vascular, cardiac, and general surgery procedures (UNEP, 2018). These products can contain PFOA residual at or below 1 ppm. Moreover, PTFE can be made without PFOA, and alternatives are reportedly now commercially available, approved by the US Food and Drug Administration (FDA), and are a feasible and effective alternative to the use of PFOA (UNEP, 2018).

The main issue for alternatives was the resistance to saline solutions. Some low friction technical issues of PFOA-free PFTE medical devices also existed (Nesbitt, 2017). The second generation of PFOA-free PTFE products have resolved these bonding issue by optimized manufacturing processes (Nesbitt, 2017). However, socio-economic analyses demonstrated that a short transition period to PFOA-free PFTE medical devices would not be cost-effective (ECHA, 2015b). Therefore, Parties to the Convention agreed on specific five-year exemptions for PFOA, its salts and related compounds used in invasive and implantable medical devices at the COP meeting in May 2019.

Current situation related to PFOS

Parties to the Convention have eliminated exemptions/acceptable purpose for PFOS, its salts and related compounds in medical devices.

Current situation related to PFOA

Parties to the Convention agreed on specific five-year exemptions for PFOA, its salts and related compounds used in invasive and implantable medical devices at the COP meeting in May 2019.

In the EU, PFOA, its salts and PFOA-related compounds are allowed in invasive and implantable medical devices until July 4, 2025 (REGULATION (EU) 2020/784, 2020).

3.2.11 Other uses

3.2.11.1 Paper and packaging

PFAS have been applied to paper to impart grease, oil and water resistance since the early 1960s (Posner, 2013). These chemicals were used in the paper, food packaging and commercial packaging as a part of a polymer. For food packaging, the German *Bundesinstitut für Risikobewertung* (BfR) currently lists 12 fluorinated substances that are likely to be used as food packaging materials. At the same time, the US Federal Drug Administration (FDA) lists 28 fluorinated substances to confer grease/oil/water-resistance to food packaging materials (OECD, 2020). In this way, PFASs get into the food and human body through treated food packaging. These packaging materials may be recycled, and PFASs hence would be transferred into new articles.

The long-chain PFASs (LC PFASs) previously used in food packaging were generally a mixture C8, C10 and C12 chain length PFASs. These have been progressively replaced by short-chain PFAS which are mainly based upon C6 technology as regulatory pressure has grown since 2000 (OECD, 2020). In addition, fluorine-free applications, like denser paper, plastic films, and silicone emulsions, can be used in consumer articles (UNEP, 2011).

The following uses in food contact applications have been reported (Begley et al., 2005; OECD, 2020; UNEP, 2011)):

(a) Disposable plates;

(b) Food containers, such as take out boxes, Pizza boxes and wraps, Popcorn bags;

(c) Baking paper;

(d) Biscuits and sweets packaging.

The following uses in non-food contact applications have been reported (Begley et al., 2005; UNEP, 2011):

(a) Folding cartons;

(b) Containers;

(c) Carbonless forms and masking papers;

(d) Tablecloths;

(e) Wallpaper.

Information related to PFOS

Paper protection by PFOS-related compounds has been achieved by using one of the following (UNEP, 2011):

(a) Mono-, di- or triphosphate esters of N-ethyl perfluorooctane sulfonamidoethanol (EtFOSE);

(b) N-Methyl perfluorooctane sulfonamidoethanol acrylate polymers.

Before 2000, about 32% of the total use of PFOS in the European Union was for paper coating; the use of PFOS for this purpose was prohibited in 2006 (UNEP, 2011).

The following sets out a list of the main suppliers of fluorochemicals in the paper industry, and their brand names of products known to have contained PFOS-related substance:

(a) 3M Scotchban®;

(b) Bayer Baysize S®;

(c) Ciba (BASF) Lodyne®;

(d) Clariant Cartafluor®21;

(e) DuPont Zonyl®.

Information related to PFOA

Uses of Non-polymeric PFOA-related compounds are known to provide a water, grease and soil protection as surfactants (wetting agents) in the paper and packaging industry.

Current situation related to PFOS

According to COP 9, SC-9/4, as there were no longer any Parties registered for specific exemptions for the production and use of PFOS, its salts and PFOFS for paper and packaging, no new registrations may be made with respect to them. Parties to the Convention have eliminated the exemptions for PFOS, its salts and related compounds in paper and packaging.

Current situation related to PFOA

There are no exemptions for PFOA, its salts and related compounds for the paper and packaging industry.

Table 18: Use, function, and concentration of PFOS, PFOA and related compounds in the paper and packaging industry.

Compounds	Use	Function	Concentration
PFOS-related: Ammonium bis (N-ethyl-2-perfluoroalkylsulfonamido ethyl) phosphates, containing not more than 15% ammonium mono (N-ethyl-2-perfluoroalkylsulfonamido ethyl) phosphates, where the alkyl group is more than 95% C8 and the salts have a fluorine content of 50.2 - 52.8% as determined on a solids basis (CAS No.: 30381-98-7)	Surface treatment		0.1% - 1.0% based on dry weight of paper
PFOS-related: Perfluoroalkyl acrylate copolymer, containing 35 to 40 wt% fluorine, produced by the copolymerization of ethanaminium, N,N,N-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)-oxy]-, chloride; 2-propenoic acid, 2-methyl-, oxiranylmethyl ester; 2-propenoic acid, 2-ethoxyethyl ester; and 2-propenoic acid, 2[[(heptadecafluoro-octyl)sulfonyl]methyl amino]ethyl ester (CAS No.:92265-81-1)	Surface treatment	Oil, grease and water repellence	0.1% - 1.0% based on dry weight of paper
PFOA-related Polyfluoroalkyl phosphonic acid (PAPs/diPAPs)	Surfactant	Levelling and wetting agents	
PFOA polymer	Surface treatment	Used to impart grease, oil and water resistant properties	The content of side-chain fluorinated polymers is about 0.3 – 1 % (ECHA) Food contact material PFOA: 0 - 4646 ng/g 8:2 FTOH: 0 - 8310 ng/g (Liu et al., 2014)

3.2.11.2 Aviation

Information related to PFOS

Hydraulic oils with a PFOS-related substance, such as potassium perfluorooctane sulfonate, have been used in civil and military airplanes since the 1970s with a concentration of about or less than 0.1% (United States patent 3679587 dates from 1972). These substances are used to prevent evaporation, fires and corrosion (UNEP, 2011). Aircraft

hydraulic fluids are used in enclosed mechanical systems under controlled conditions, which significantly reduces the risk of a release into the environment.

Fluorinated chemicals other than PFOS can be used. The potassium salt of perfluoroethylcyclohexyl sulfonate (CAS No. 67584-42-3) is not a PFOS precursor, and it has been used in hydraulic oils instead of PFOS in the past. However, like other C6 compounds it is likely to be persistent and 3M, which formerly produced this chemical, has ceased production. (Posner, 2013).

Information related to PFOA

Not relevant.

Current situation related to PFOS

By COP 9, SC-9/4, Parties to the Convention have eliminated acceptable purpose for PFOS, its salts and related compounds in aviation hydraulic fluid.

Table 19: Use, function, and concentration of PFOS and related compounds in aviation.

Compounds	Use	Function	Concentration
PFOS-related compounds, such as potassium perfluorooctane sulfonate	used as a component of fire-resistant hydraulic fluids	inhibit erosion and damage to parts of the hydraulic systems	PFOS-related substance: at ppm level ((Brooke et al., 2004)
PFOA, its salts and related compounds	No information		

3.2.11.3 Coating, coating additives and ink

Information related to PFOS

PFOS-related compounds were used in coatings, paint and varnishes to reduce surface tension. Uses were, but not limited to, substrate wetting, for levelling, as dispersing agents, improving gloss and antistatic properties. PFOS-related compounds could be used as additives in dyes and ink, as pigment grinding aids, and as agents to counteract pigment flotation problems.

The concentrations used were below 0.01 wt %. Information from suppliers in the paint and varnish industries suggested that fluorosurfactants were in general much more expensive than other alternative surfactants (Cheremisinoff, 2016).

Information related to PFOA

PFOA, its salts and related compounds have been used in coating for smartphone manufacturers requested for pulsed plasma nano-coating (ECHA, 2015b).

Comments from the industry submitted during the EU public consultation indicated that PFOA and related compounds are present in latex inks used in professional printers. This use only continues in printers that are no longer manufactured, and therefore a phase-out is already underway (UNEP, 2017a).

Current situation related to PFOS

According to COP 9, SC-9/4, as there were no longer any Parties registered for specific exemptions for the production and use of PFOS, its salts and PFOFS for coating and coating additives, no new registrations may be made with respect to them. Parties to the Convention have eliminated the exemptions for PFOS, its salts and related compounds in coating and coating additives.

Current situation related to PFOA

There is no exemption of PFOA, its salts and related compounds in coating, coating additives and ink.

3.2.11.4 Rubber and plastics

Information related to PFOS

PFOS-related compounds were used as release agents for the manufacture of rubber and plastics. A release agent is a chemical, often wax, silicone or fluorocarbon fluid, used in moulding and casting, that aids in the separation of a

mould from the material being moulded. PFOS-related compounds have been used as surfactant due to the chemical stability and unreactive nature. While reducing imperfections in the moulded surface, PFOS are also known as a parting agent, mould lubricant, mould release lubricant and de-moulding agent.

Information related to PFOA

PFOA is used in the manufacture of polytetrafluoroethylene (PTFE), polyvinylidene fluoride (PVDF), polyfluoroethylene propylene (FEP), and fluoroelastomers. For more information see Chapter 3.3.2.

Current situation related to PFOS

According to COP 9, SC-9/4, as there were no longer any Parties registered for specific exemptions for the production and use of PFOS, its salts and PFOFS rubber and plastics, no new registrations may be made with respect to them. Parties to the Convention have eliminated the exemptions for PFOS, its salts and related compounds in rubber and plastics.

Current situation related to PFOA

See Chapter 3.3.2.

3.2.11.5 Chemically driven oil/gas production and mining

Information related to PFOS

PFOS and its related compounds have been used as surfactants in the oil and gas industries to enhance oil or gas recovery in wells, as evaporation inhibitors for gasoline and as jet fuel and hydrocarbon solvents. At the same time oil and gas production and mining were reportedly carried out without the use of PFOS and its related compounds in other countries, including developing countries.

PFOS-related compounds were occasionally used as surfactants in the mining industry to enhance the amount of recovery in copper and gold mines. Tetraethylammonium perfluorooctane sulfonate and potassium perfluorooctane sulfonate were used as acid mist suppressing agents (Corado, 2011).

Information related to PFOA

Similar to PFOS, PFOA and its related compounds has been used in oil-well stimulation during water flooding and in nonaqeous stimulation fluids for foaming hydrocarbon liquids (Glüge et al., 2020). Examples (are fluorotelomer alcohols (8:2 FTOH) and 1-Alkaneamine, perfluoro-N,N-dimethyl-, N-oxide ($C_nF_{2n+1}CH_2CH_2N(CH_3)_2O$) (Glüge et al., 2020).

Current situation related to PFOS

By decision SC-9/4, the Conference of the Parties eliminated acceptable purpose for PFOS, its salts and related compounds in chemically driven oil production.

Current situation related to PFOA

No exemption in this application

3.3 Import and export

The information on imports and exports of the relevant chemicals of the document should be compiled in the inventory report. Information on import/export of these chemicals could be available from customs services, related industries, and related industry associations. Information on both current and historic imports and exports should be sought. When contacting the relevant stakeholders for the information on the import/export of the relevant chemicals of the document, also information on the related uses should be sought.

PFOS, PFOA, their salts, and related compounds can be imported in raw material or in end-user-products. For instance, PFOI, a PFOA-related compounds, has been imported as raw material for the production of perfluorooctyl bromide in order to produce pharmaceutical products. The relevant chemicals of the document can also be imported as contamination or residuals in the raw material or end-user-products, such as protection clothing for workers and invasive and implantable medical devices made from PTFE. The information of import and export should be cross-checked by comparing it with any available information on the material flows in main uses described in 3.2.

HS Code

As mentioned in Chapter 2.4.1 PFOS, its salts and PFOSF are listed in Annex III to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. These

substances are subject to the Prior Informed Consent (PIC) procedure. PFOS, some of its salts and related compounds are therefore assigned of specific HS codes. Moreover, some fluoropolymers are also assigned the HS Codes (see Table 20). HS codes are used in import and export declaration, which can be used to sought necessary information for the inventory. CAS numbers and trade names should also be used to sought the import and export information.

3.4 Stockpile of PFOS and PFOA

The generation of wastes and stockpiles containing PFOS and PFOA will depend on the management of the (former) uses of these chemicals and on the management of the chemicals unintentionally generated. Due to the long shelf time of some products, such as fire-fighting foams (AFFF), there can be still significant amount of PFOS, PFOA and related compounds in stock.

Stockpiles of PFOS- or PFOA-containing AFFF have the potential to be emitted by leaching and spills and must be managed in a safe, efficient, and environmentally sound manner. This is to prevent the chemicals posing a serious risk to the environment or human health, for example by contaminating soil or groundwater.

Based on review of the major uses of products containing PFOS and PFOA, a large part of stockpiles will be fire-fighting foam (AFFF) at oil/gas industry facilities, airports, warehouses, car parking facilities and storage facilities of chemical importers. Furthermore, stockpiles of PFOS- and PFOA-containing agents such as surfactants in the photolithography process of semiconductor industry, as well as PFOS and PFOA residual in the final products (such as functional clothes for workers) shall also be considered.

3.5 Waste of PFOS and PFOA

It is likely that PFOS, PFOA, their salts and related are released into the environment throughout their life cycles (production, product assembly, consumer use, disposal, and recycling) (UNEP, 2020c). Releases of PFAS to the environment have caused large-scale contamination in many countries (ECHA, 2015a; Glüge et al., 2020). In comparison to other prior contaminants, PFAS are severely complicated by their mobility, persistence, toxicological uncertainties, and technical obstacles to remediation(Simon et al., 2019). Thus, it presents extreme complex challenges to the environmental community.

A robust inventory of wastes should be developed as a basis for the environmentally sound management of these wastes. PFOS wastes and PFOA wastes may be found in a number of physical forms, including (UNEP, 2020c):

(a) Solid obsolete stockpiles of PFOS, PFOA, their salts and related compounds in original packages which are no longer usable because their shelf life has been exceeded or the packaging has deteriorated;

(b) Solid waste (food packaging materials, paper, textiles, leather, rubber and carpets);

(c) Production wastes from fluorinated chemicals;

(d) Fire suppression equipment;

(e) Wastewater from industrial and municipal processes;

(f) Solid residues from wastewater treatment such as activated carbon treatment;

(g) Sludge, including sewage sludge;

(h) Polluted soil and sediments;

(i) Landfill leachate;

(j) Liquid industrial and household cleaning products;

(k) Liquid fluids (aviation hydraulic fluids).

Waste streams of importance in terms of potential volume or concentration are as follows:

(a) Sludge and wastewater from metal plating semiconductor and photographic industrial activities;

(b) Sludge and wastewater from municipal treatment plants;

(c) Landfill leachate;

(d) Leather and upholstery;

(e) Carpets;

(f) Fire-fighting foams equipment;

(g) Textiles;

(h) Obsolete stockpile.

Paragraph 1 (d) (III) of Article 6 of the Convention requires each Party to take appropriate measures so that wastes consisting of, containing or contaminated with a chemical listed in Annex A, B or C are not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants. Management of PFAS containing waste is challenging. The latest techniques, that may be used to destroy or dispose PFAS and PFAS-containing materials/wastes from non-consumer products, such as fire-fighting foams, was outlined in a new guidance from US EPA in February 2020 (US EPA, 2020).

For further waste management guidance on 1) PFOS, its salts and PFOSF and 2) PFOA, its salts and PFOA-related compounds, please refer to the following documents:

(a) General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (UNEP, 2010);

(b) Draft technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) (UNEP, 2014);

(c) Draft updated technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride and perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds (UNEP/CHW/OEWG.12/INF/8) (UNEP, 2020c);

(d) Methodological guide for the development of inventories of hazardous wastes and other wastes under the Basel Convention (UNEP, 2013).

3.6 Contaminated sites

A site is generally considered contaminated by POPs when the concentration of one or more contaminants exceeds the regulatory criteria or poses a risk to humans and/or the environment. According to Article 6 of the Convention, Parties shall endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C (para 1 (e)).

The inventory process could be used to identify contaminated sites. Release of PFAS containing wastes to the environment causes contamination. Direct release to the environment occurs from the production of the relevant chemicals, during the processing, use and disposal of the chemicals, from PFAS-treated articles and from products contaminated with these chemicals. An example is use of PFAS containing AFFF in open application at a training site, which results in contamination of soil and groundwater. Since PFAS can be quite mobile, they form very long contamination plumes in groundwater, resulting at times in secondary conaminaiton. For instance, where agricultural areas are being irrigated with contaminated groundwater (UBA, 2020b). Since the PFOS, PFOA and related compounds have been used since 1950s, a large part of these chemicals has already entered the environment or landfills and dump sites, which are also potential contaminated sites (Busch et al., 2010). The extent of pollution around the site of emission can reach up to several tens of kilometers (Oliaei et al., 2013).

Moreover, extensive PFAS contamination has been caused by applying PFAS-contaminated ‘’soil improver/fertilier’’ in comparatively large quantities over a large area. Researchers found that reuse of contaminated paper sludge and compost as fertilisers has led to PFAS pollution of soil (BMU, 2020; Ghisi et al., 2019) and water in Austria, Germany, Switzerland and the US (Nordic Council of Minister, 2019). Airborne contaminents from chimney or air exhaust systems, which are deposited into the surroundaing soils and waters, have also contributed to extensive contamination (UBA, 2020b). Examples of contaminated sites are listed in Table 21.

Typical sources of PFOS or PFOA to the local environment and potenial contaminated sites include:

(a) Chemical production site where the relevant chemicals are produced and used;

(b) Production site where PFOS, PFOA and related compounds are used, such as metal plating, semiconductor and photographic industrial;

(c) Landfill site;

(d) Sites where PFOS/PFOA -containing fire-fighting foams have been used with releases into the environment;

(e) Airports;

(f) Mining area;

(g) Rivers / Ponds receiving wastewater from (a) - (f);

(h) Agricultural land receiving contaminated sewage sludge as fertilizer.

Table 21: Examples of contaminated sites.

Activity	Contaminated area	Concentration	Source
Production of PTFE and other chemicals	Riverwater	PFOA: 22 - 668 ng/L	(Bao et al., 2011)
	Sediment of river	PFOA: 0.18 - 48 ng/g dry weight	
Landfill	Groundwater under a landfill site	PFOA: 42000 ng/L PFOS: 2700 ng/L	(Oliaei et al., 2013)
Application of contaminated paper sludge and compost in agricultural land	Soil	PFOA: 60 – 250 µg/kg 6:2/8:2 diPAP: 70 – 210 µg/kg	(Bugsel & Zwiener, 2020)
Aircraft hydraulic fluid and fire-fighting training site (from/near an airport)	Downstream surface water	PFOS:130 ng/L	(De Solla et al., 2012)

To assess if the sites reported by stakeholders are contaminated, criteria and maximum acceptable levels must be developed. When the concentration of PFOS and PFOA in soil or drinking water of a region exceed certain threshold values for the protection of human health, the region is considered as contaminated site. Table 22 contains examples of levels used in different countries. Updated standards and guidance values shall be sought online from the website of The Interstate Technology and Regulatory Council (ITRC)[10].

Table 22: Examples of advisory or normative levels of PFOS and PFOA from different countries.

Country	Level	Compounds	Media	Source of information
USA	0.07 µg/L	PFOS+PFOA	Drinking water	U.S. EPA (2016)
Germany	0.1 µg/L	Sum of PFAS, covering the concentration of 20 PFAS with a chain length of four to thirteen carbon atoms	Drinking water, life-long tolerable guideline value for all age group	UBA (2020a)
	0.05 µg/L	PFOS	For sensitive population groups including pregnant women, nursing mothers, infants and young children up to 24 months of age.	
	0.05 µg/L	PFOA		
Canada	0.6 µg/L	PFOS	Surface water	Environment and Climate Change Canada (2018)

[10] PFAS Fact Sheets of The Interstate Technology and Regulatory Council (ITRC): https://pfas-1.itrcweb.org/fact-sheets/.

Australia	0.07 µg/L	PFOS+PFHxS	Drinking water quality value	Australian Government Department of Health (2019)
	0.56 µg/L	PFOA		
Sweden	0.09 µg/L	Sum of these 11 PFASs including PFBS, PFHxS, PFOS, 6:2 FTSA, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA and PFDA	Drinking water	European Commission (2018)

The following documents are suggested for overview information on PFOS and PFOA contaminated sites:

(a) Persistent Organic Pollutants: Contaminated Site Investigation and Management Toolkit (UNIDO, 2010);

(b) Production sites (Bao et al., 2011; Brambilla et al., 2015; Oliaei et al., 2013; Y. Wang et al., 2010) ;

(c) Fire-fighting foam use (Buncefield Major Incident Investigation Board (BMIIB), 2008; De Solla et al., 2012; D Herzke et al., 2007; Moody et al., 2003; Seow, 2013; Weber et al., 2010);

(d) Airports (Ahrens et al., 2015; Awad et al., 2011; De Solla et al., 2012) ;

(e) Landfills and dump sites (Busch et al., 2010; Eggen et al., 2010; Kallenborn et al., 2004; Oliaei et al., 2013; Weber et al., 2011; Woldegiorgis et al., 2006) ;

(f) Application of highly contaminated industrial sludge from (industrial) waste water treatment (Brambilla et al., 2015; Kowalczyk et al., 2013; Kröfges et al., 2007; Sepulvado et al., 2011; Skutlarek et al., 2006).

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Appendix 1: Calculation of the relevant chemicals of the document produced and used for different industrial sectors

The assessment can be based on a qualitative or a quantitative approach, depending on the situation of each individual Party. The qualitative approach is recommended in this guidance document for Tier I and Tier II inventories.

The total quantity of PFOS and its related chemicals used in industrial processes can be estimated from the known levels of PFOS and its related chemicals in the chemical compounds used in specific processes or manufactured. If stakeholders have not provided the concentrations applied, the guidance values in tables 10 and 11 may be used.

Use the following equation to estimate the total quantity of PFOS and its related chemicals used in chemical agents in industrial processes or chemical formulas such as textile formulas:

$Tc=L \cdot C$

$Tc=$ **Total quantity of PFOS used in the industrial process per year**

$L=$ **PFOS concentration or percentage of PFOS in the chemical agent, drilling fluid or chemical formula**

$C=$ **Yearly consumption of the chemical agent, drilling fluid or chemical formula**

Use the following equation to estimate the total quantity of PFOS (and its related compounds) used in the manufacture of chemical agents, chemical formulas or articles, such as fire-fighting foams:

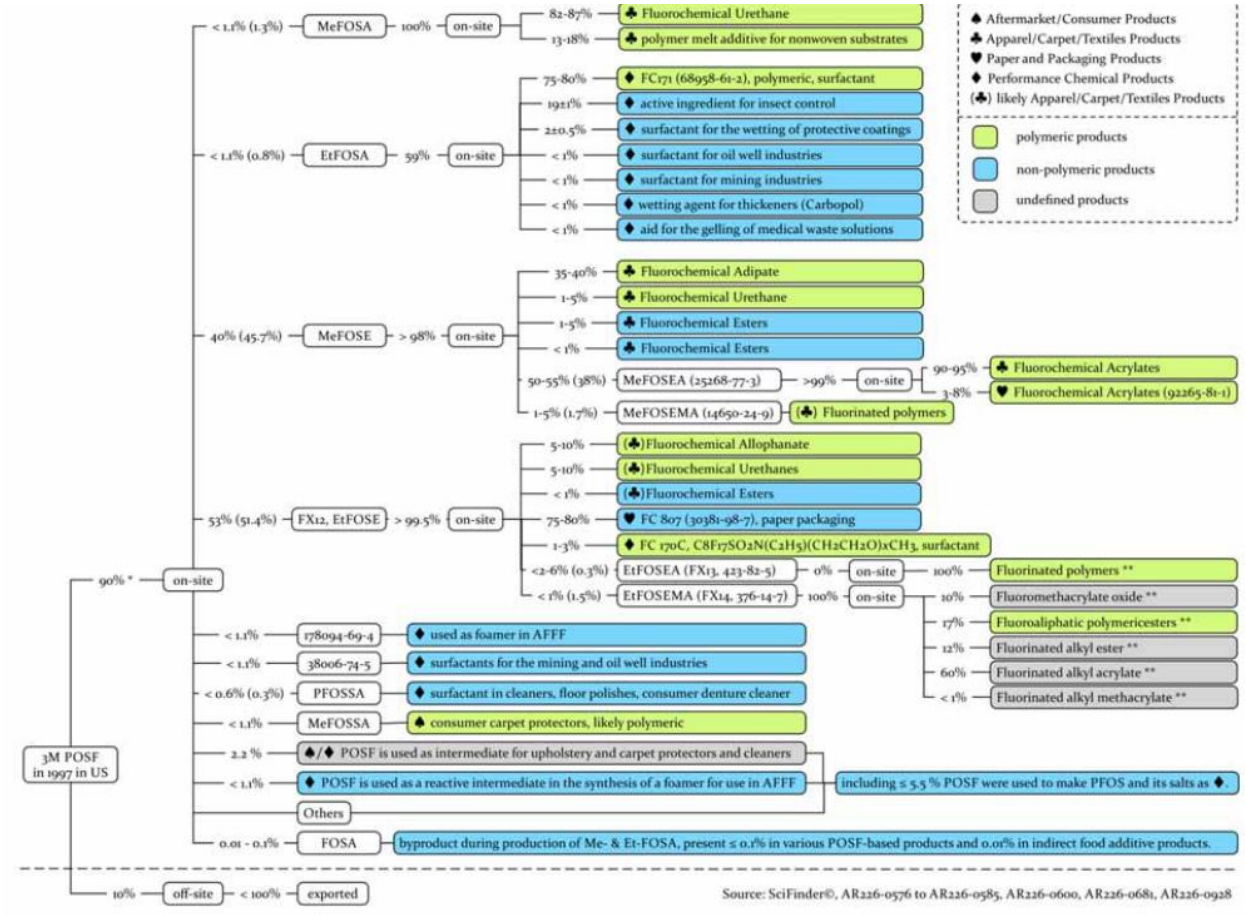
$Tp=L \cdot P$

$Tp=$ **Total quantity of PFOS used in the industrial process per year**

$L=$ **PFOS concentration or percentage of PFOS in the chemical agent, chemical formula or product**

$P=$ **Yearly production of the chemical agent, chemical formula or product**

Appendix 2: Substance flow of PFOSF-based products manufactured by 3M in 1997 in the US.



Source: Z. Wang et al. (2014)

Appendix 3: Questionnaire for (metal) plating industry

Note: This questionnaire collects information related to PFOS, its salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Type of plating process.

(a) Chromium ☐
(b) Nickel ☐
(c) Plastics ☐
(d) Others (Please specify) _____

3. Chemicals used in the process which contain or might contain PFOS, its salts or precursors, if possible with safety data sheets. Typical chemical mixtures are mist suppressant, foam suppressant, wetting agent, etc.

No.	Name of chemical or chemical mixture	CAS number	Annual amount (weight or volume)	Does it contain PFOS, its salts or precursors? (yes no or unknown)
1				
2				
3				
4				

4. If you are aware that any of the chemicals (chemical mixtures) used contain PFOS, its salts or precursors, continue with the list below. Use all information available from safety data sheets or suppliers and producers (attach safety sheet if possible).

No. (No. of chemical (mixture) in section above (Section 3). If No.2 in the table above contains PFOS, then write "2" here.)	Name of contained PFOS, its salts or precursors	CAS number of PFOS, its salts or precursors	Function (foam suppressant, wetting agent etc.)	Content of PFOS, its salts or precursors (%)	Annual used amount of PFOS, its salts or precursors (weight or volume)

5. Stockpiles of chemical mixtures and wastes containing PFOS, its salts and precursors.

Name of chemical (mixture) or waste	Storage conditions	Average stored quantity	Name of contained PFOS, it salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

6. How is the waste from the metal-plating process managed? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify)

Type of waste	Waste treatment
Chemicals becoming waste	
Plating bath when becoming waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

7. Are you aware of locations that are contaminated with PFOS or its related compounds?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, its salts or precursors (μg/L or μg/g)

8. Please name the suppliers and producers of the chemical mixtures that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

9. Remarks.

10. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 4: Questionnaire for textile manufacturers and retailers

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Select the types of activity of your textile business that apply.

Impregnation or coating of textile and leather (4.1)	☐	Bulk sale of coated textile, leather apparel and upholstery (4.5)	☐
Manufacturing of apparel and upholstery made with impregnated textile and leather (4.2)	☐	Retail sale of coated textile, leather apparel and upholstery (4.5)	☐
Import or export of coated textile, leather, apparel or upholstery (4.3)	☐	Cleaning or repair of apparel and upholstery made with impregnated textiles and leather (4.6)	☐
Recycling of coated textile, leather, apparel or upholstery (4.4)	☐	Others (please specify) (4.7):	☐
Disposal of coated textile, leather, apparel or upholstery (4.4)	☐		

3. Indicate the properties of the textile and leather you deal with.

Water resistant/repellent	☐	Stain resistant	☐
Synthetic	☐	Dirt resistant or repellent	☐
Oil and grease resistant	☐	Others (please specify):	☐

4. Please specify the quantity of textiles you deal with.

4.1 Impregnation or coating of textile and leather.

Type (Textile, leather or others, please specifiy) and name	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

4.2 Manufacturing of apparel or upholstery made with impregnated textile and leather.

Product type (apparel, upholstery or other)	Material (Textile or leather or other)	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

4.3 Import or export of coated textile, leather, apparel, or upholstery.

Import or export	Type (Textile, leather, apparel, upholstery, or others)	Material of apparel and upholstery (e.g., leather)	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

4.4 Recycling or disposal of impregnated or coated textile, leather, apparel, or upholstery.

Recycling or disposal	Type (Textile, leather, apparel, upholstery, or others)	Material of apparel and upholstery (e.g., leather)	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

4.5 Bulk sale or retail sale of impregnated or coated textile, leather, apparel, or upholstery.

Bulk sale or retail sale	Type (Textile, leather, apparel, upholstery, or others)	Material of apparel and upholstery (e.g., leather)	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

4.6 Cleaning or repair of apparel and upholstery made with impregnated textiles and leather.

Cleaning or repair	Type (Textile, leather, apparel, upholstery, or others)	Material of apparel and upholstery (e.g., leather)	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

4.7 Others, please specify.

Activity	Type (Textile, leather, apparel, upholstery, or others)	Material	Annual amount (Kg or m^2)	Is it for medical use or work wear? (Yes or no)

5. Which chemicals have been used for cleaning, impregnation or coating of the textiles and products you deal with or manufacture? Use the information available from safety data sheets or suppliers and producers (attach safety data sheets if possible).

No.	Name of chemical mixtures	Product code/number, and CAS number	Type of textile or product	Weight ratio of chemical mixture applied	Does it contain PFOS, PFOA, their salts or precursors? (unknown, yes or no)
				[wt %]	
				[wt %]	
				[wt %]	

6. If you are aware that any of the chemicals (chemical mixtures) used contain PFOS, PFOA, their salts or precursors, continue with the list below. Use all information available from safety data sheets or suppliers and producers (attach safety sheet if possible).

No. (No. of chemical (mixture) in section above (Section 5). If No.2 in section 5 above contains PFOS, then write "2" here.)	Name of PFOS, PFOA, their salts or precursors	CAS number of PFOS, PFOA, their salts and precursors	Content of PFOS, PFOA, their salts or precursors (%)	Annual quantity of PFOS, PFOA, their salts or precursors (weight)

7. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors.

Name of chemical (mixture), or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

8. How are wastes managed by the facility? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify).

Type of waste	Waste treatment
Chemicals becoming waste	
Materials becoming waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

9. Are you aware of locations that are contaminated with PFOS, PFOA, their salts or precursors?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, PFOA, their salts or precursors (µg/L or µg/g)

10. Please specify the <u>suppliers or producers</u> of the <u>chemical mixtures and materials</u> that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

11. Please specify your customers of products that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported (if yes, please specify the country of export)	Contact information

12. Remarks.

13. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 5: Questionnaire for synthetic carpet sector

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Select all types of activities of your business that apply.

Production of synthetic carpets	☐	Cleaning and reimpregnation of synthetic carpets	☐
Import of synthetic carpets	☐	Recycling of synthetic carpets to produce materials for other consumer products	☐
Export of synthetic carpets	☐	Waste disposal of synthetic carpets	☐
Retailers of synthetic carpets	☐	Others (please specify):	☐

3. Select the type of synthetic carpets do you deal with.

Synthetic carpets for households	☐	Synthetic carpets for any other indoor use	☐
Synthetic carpets for hotels	☐	Synthetic carpets for outdoor use	☐
Synthetic carpets for cars	☐	Old synthetic carpets for reuse or recycling	☐
Synthetic carpets for trains	☐	Others (please specify):	☐

4. Indicate the properties of the carpets you deal with.

Water resistant or repellent	☐	Stain resistant	☐
Synthetic	☐	Dirt resistant/repellent	☐
Oil and grease resistant	☐	Contain flame retardants	☐
Others(please specify):	☐		

5. Please specify the quantity of synthetic carpets you deal with.

Activity (e.g., production, import, etc.)	Types of synthetic carpets	Average quantity of synthetic carpets per year (kg or m^2)

5A. If other consumer products have been produced by recycling synthetic carpets produced before 2003, please specify the product and its annual production amount. The year of 2003 has been recognized as the threshold year when use of PFOS was discontinued in commercial repellent chemicals.

Types of consumer products produced from synthetic carpets made prior to 2003	Average quantity of products per year (kg or m^2)

6. Which chemicals have been used for cleaning, impregnation or coating of carpets you deal with or manufacture? Use the information available from safety data sheets or suppliers and producers (attach safety data sheets if possible).

No.	Name of chemical mixtures	Product code or number and CAS number	Type of carpet	Weight ratio of chemical mixture applied (wt%)	Does it contain PFOS, PFOA, their salts or precursors? (unknown, yes or no)

7. If you are aware that any of the chemicals (chemical mixtures) used contain PFOS, PFOA, their salts or precursors, continue with the list below. Use all information available from safety data sheets or suppliers and producers (attach safety sheet if possible).

No. (No. of chemical (mixture) in section above (Section 6). If No.2 in table 6 above contains PFOS, then write "2" here.)	Name of contained PFOS, PFOA, their salts or precursors	CAS number of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Annual quantity of PFOS, PFOA, their salts or precursors (weight)

8. How are wastes managed by the facility? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify)

Type of waste	Waste treatment
Wastewater	
Solid waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

9. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors.

Name of chemical (mixture), or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

10. Are you aware of locations that are contaminated with PFOS, PFOA, their salts or precursors?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, PFOA, their salts or precursors (µg/L or µg/g)

11. Please specify the <u>suppliers or producers</u> of the <u>chemical mixtures and materials</u> that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

12. Please specify your customers of products that might contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported (if yes, please specify the country of export)	Contact information

13. Remarks.

14. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 6: Questionnaire for pulp and paper industry

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. State the type of technology you use in your production.

3. What type of papers do you produce?

(a) Uncoated wood-free printing and writing papers	☐	(b) Tissue paper	☐
(c) Coated wood-free printing and writing paper	☐	(d) Recycled paper	☐
(e) Papers coated with water and oil or grease repellent	☐	(f) Speciality paper	☐
(g) Other paper (please specify) _____			

4. Which chemicals have been used for impregnation or coating of paper or paperboard in the products you manufacture or recycle? Use the information available from safety data sheets or suppliers and producers (attach safety data sheets if possible).

No.	Name of chemical mixtures	Product code or number, or CAS number	Type of paper	Weight ratio of chemical mixture applied (wt%)	Does it contain PFOS, PFOA, their salts or precursors? (unknown, yes or no)

5. If you are aware that any of the chemicals (chemical mixtures) used contain PFOS, PFOA, their salts or precursors, continue with the list below. Use all information available from safety data sheets or suppliers and producers (attach safety sheet if possible).

No. (No. of chemical (mixture) in section above (Section 4). If No.2 in section 4 above contains PFOS, then write "2" here.)	**Name of PFOS, PFOA, their salts or precursors**	**CAS number of PFOS, PFOA, their salts or precursors**	**Content of PFOS, PFOA, their salts or precursors (%)**	**Annual quantity of PFOS, PFOA, their salts or precursors (weight)**

6. Do any of these chemical mixtures contain <u>other</u> fluorinated carbons?

(a) Yes ☐ (b) No ☐ (c) Don't Know ☐

6A. If yes, please specify the chemicals and quantities.

Name of the chemical (mixture) used	**Product code or number**	**Name of the contained fluorinated carbon**	**Weight ratio of the fluorinated carbon in the chemical mixture (wt%)**

7. How are wastes managed by the facility? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify).

Type of waste	**Waste treatment**
Wastewater	
Solid waste	
Waste sludge from the wastewater treatment	
Others, please specify	

8. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors.

Name of chemical (mixture), or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

9. Are you aware of locations that are contaminated with PFOS, PFOA, their salts or precursors?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, PFOA, their salts or precursors (µg/L or µg/g)

10. Please specify the <u>suppliers or producers</u> of the <u>chemical mixtures and materials</u> that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

11. Please specify your customers of products that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported (if yes, please specify the country of export)	Contact information

12. Remarks.

13. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 7: Questionnaire for photographic industry

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. State the type of technology you use in your production.

3. Which types of films do you produce?

4. Which chemicals have been used in the production, that might contain PFOS, PFOA, their salts or precursors? Use the information available from safety data sheets or suppliers and producers (attach safety data sheets if possible).

No.	Name of chemical mixtures	Product code or number, or CAS number	Type of film	Weight ratio of chemical mixture applied (wt%)	Does it contain PFOS, PFOA, their salts or precursors? (unknown, yes or no)

5. If you are aware that any of the chemicals (chemical mixtures) used contain PFOS, PFOA, their salts or precursors, continue with the list below. Use all information available from safety data sheets or suppliers and producers (attach safety sheet if possible).

No. (No. of chemical (mixture) in section above (Section 4). If No.2 in section 4 above contains PFOS, then write "2" here.)	**Name of PFOS, PFOA, their salts or precursors**	**CAS number of PFOS, PFOA, their salts or precursors**	**Content of PFOS, PFOA, their salts or precursors (%)**	**Annual quantity of PFOS, PFOA, their salts or precursors (weight)**

6. Do any of these chemical mixtures contain <u>other</u> fluorinated carbons?

(a) Yes ☐ (b) No ☐ (c) Don't Know ☐

6A. If yes, please specify the chemicals and quantities.

Name of the chemical (mixture) used	**Product code or number**	**Name of the contained fluorinated carbon**	**Weight ratio of the fluorinated carbon in the chemical mixture (wt%)**

7. How are wastes managed by the facility? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify)

Type of waste	**Waste treatment**
Wastewater	
Solid waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

8. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors.

Name of chemical (mixture), or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

9. Are you aware of locations that are contaminated with PFOS, PFOA, their salts or precursors?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, PFOA, their salts or precursors (µg/L or µg/g)

10. Please specify the <u>suppliers or producers</u> of the <u>chemical mixtures and materials</u> that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

11. Please specify your <u>customers</u> of products that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported (if yes, please specify the country of export)	Contact information

12. Remarks

13. Respondent

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 8: Questionnaire for semiconductor industry and electronics industry

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Type of sector.

Type of sector (semiconductor, electronics, etc.)	Type of products	Average production of electronic devices per year (kg)

3. Tick process stages that apply for your company.

Photoresist and anti-reflective coating	☐	Photo-mask	☐
Etching agent for compound semi-conductors and ceramic filters	☐	Edge bead removers	☐
De-gluing agents	☐	Developing agent	☐
Metal plating in closed loop system	☐	Hard metal plating	☐
Decorative metal plating	☐	Desmear agent	☐
Dispersion	☐	Surface treatment	☐
Solder	☐	Paint	☐
Adhesive	☐	Others (please specify):	☐

4. Please indicate if your process uses chemicals containing PFOS, PFOA, their salts or precursors? No ☐ Yes ☐

If the answer is yes, please fill in the following two tables.

Table 4A: List of chemical agents that contain PFOS, PFOA, their salts and precursors.

No.	Name of chemical agent	Product code or number, or CAS number	Application of the chemical agent (e.g. etching agent, photoresist agent, solder, etc.	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (wt%)

Table 4B: Annual usage of chemical agents that contain PFOS, PFOA, their salts and precursors.

No.	Name of chemical agent	The amount of chemical mixture or agent used in the past and planned to be used in the future [kg]		
		Last year	This year	Next year

5. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors

Name of chemical (mixture), or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

6. How are the PFOS or PFOA-containing wastes managed? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify)

Type of waste	Waste treatment
Wastewater	
Solid waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

7. Are you aware of locations that are contaminated with PFOS, PFOA, their salts or precursors?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, PFOA, their salts or precursors (µg/L or µg/g)

8. Please specify the suppliers or producers of the chemical mixtures and materials that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

9. Please specify your customers of products that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported (if yes, please specify the country of export)	Contact information

10. Remarks.

11. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 9: Questionnaire for chemical and pharmaceutical industry

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Are you (multiple choice):

A producer of chemicals or products ☐
A supplier of chemicals or products ☐
A downstream user of chemicals or products ☐

Please specify type of chemicals or products you produce or supply:

PFOS its salts or related compounds	☐	Coating, coating additives , paint or ink	☐
PFOA, its salts or related compounds	☐	Impregnation and coating formulas for textiles	
Pharmaceutical industry	☐	Impregnation and coating formula for carpets	☐
Fire-fighting foam	☐	Impregnation and coating formula for leather	☐
Aviation hydraulic fluids	☐	Impregnation and coating formula for paper and packaging	☐
Insecticides/Biocides	☐	Chemicals for use in the electronics industry	
Drilling fluids	☐	Chemicals for use in the photographic industry	☐
Chemicals for use in the metal-plating industry	☐	Cleaning agent or care agent for carpet, textile, stone, etc.	
Chemicals for use in semiconductor manufacture	☐	Other mixture containing PFOS, PFOA, their salts or precursors, e.g. industrial surfactant. – please specify	☐
Others (please specify):			

3. What kind of raw materials containing PFOS, PFOA, their salts or precursors does your company use?

Name of chemical (mixture) or raw materials	Product code or number and CAS number	Annual amount used (weight)	Name of contained PFOS, PFOA, their salts or precursors	CAS number of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)

4. What kind of products containing PFOS, PFOA, their salts or precursors does your company produce?

Name of chemical (mixture) or product	Product code or number, and CAS number	Annual amount produced (weight)	Name of contained PFOS, PFOA, their salts or precursors	CAS number of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)

5. How are the PFOS or PFOA-containing wastes managed? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify)

Type of waste	Waste treatment
Wastewater	
Solid waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

6. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors.

Name of chemical (mixture), or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

7. Are you aware of locations that are contaminated with PFOS, PFOA, their salts or precursors?

Location (Address)	Type of contamination (Soil, water, river, etc.)	Type of activity at the location	Has the site been investigated? (unknow, yes or no)	Levels of PFOS, PFOA, their salts or precursors at the site (µg/L or µg/g)

8. Please specify the suppliers or producers of the chemical mixtures and materials that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

9. Please specify your customers of products that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported? (if yes, please specify the country of export)	Contact information

10. Remarks

11. Respondent

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 10: Questionnaire for (major) retailers of commercial products possibly containing PFOS/PFOA

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Does your store sell any of the following products?

(a)	Stain-resistant furniture	Yes ☐	No ☐
(b)	Shoes	Yes ☐	No ☐
(c)	Leather	Yes ☐	No ☐
(d)	Textiles	Yes ☐	No ☐
(e)	Clothing and apparel	Yes ☐	No ☐
(f)	Synthetic carpets	Yes ☐	No ☐
(g)	Industrial and household cleaning products	Yes ☐	No ☐
(h)	Fire-fighting foam	Yes ☐	No ☐
(i)	Biocides	Yes ☐	No ☐
(j)	Other	Yes ☐	No ☐

3. Are you aware if any of the products or articles that you sell contain or have been surface-treated with PFOS, PFOA or their-related compounds?

Yes ☐ No ☐ Don't know ☐

If yes, please specify:

Type of product	Name of product	Product code/number, and CAS number	Trade name	Content of PFOS, PFOA, their salts or precursors (e.g., %, µg/m², etc.)	Annual sale of the product

4. Stockpiles of chemicals or wastes containing PFOS, PFOA, their salts or precursors.

Name of product or waste	Storage conditions	Average stored quantity (weight)	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)	Location (Address)

5. How are wastes containing PFOS, PFOA, their salts and precursors managed by the facility? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Other – please specify).

Type of waste	Waste treatment
Chemicals becoming waste	
Materials becoming waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

6. Name of supplier of products you sell that potentially contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Imported? (If yes, please specify the country of import)	Contact information

7. Please specify your <u>customers</u> of products that (might) contain PFOS, PFOA, their salts or precursors.

Name of company	Product	Exported? (if yes, please specify the country of export)	Contact information

8. Remarks.

9. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 11: Questionnaire for fire-fighting foam users such as airports, fire-fighting department, oil and gas industry, car parking facilities, warehouses, chemical industry, etc.

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Name and producer of foams in use/ storage (Please attach safety data sheet).

No.	Trade name of fire-fighting foams currently used	Type of fire-fighting foam (Class A or Class B, AFFF or Fluorine free, concentrate or not concentrate	Producer of the fire-fighting foams	Product code or number	Quantity in storage (kg)	Year of purchase

3. Content of chemicals (Check the safety data sheet and information from the producers. Data on chemicals listed as fluorsurfactant, surfactant or surfactant agent, are of special interest. Please indicate if data on those chemicals are not provided in the safety data sheet.)

No. of fire-fighting foam in section 2	Name of the fluorinated agents such as fluorsurfactant, surfactant	CAS number	Content of the fluorinated agents (wt%)	Name of PFOS, PFOA, their salts or precursors which are contained in the fluorinated agents	Content of PFOS, PFOA, their salts or precursors in the agent (wt %)

4. Usage frequency, location and amount of fire-fighting foam used for training purposes.

Type of fire-fighting foam (No. of fire-fighting foam in Section 2)	Number of times used per year	Annual amount used (kg)	Training location (Address)

5. Location and amount of fire-fighting foam used in actual fire events (for the past 20 years).

S/N	Location of large fire event	Date	Producer and type of fire-fighting foam used (or No. of fire-fighting foam in Section 2.)	Approximated used quantity (kg)

6. How do you manage wastes generated from application of fire-fighting foam in your organization? (Fill in according to the following categories: A. Deposited in/near the factory area without treatment; B. Deposited in/near the factory area with treatment; C. Sent to an external waste treatment facility; D. Sent to a landfill; E. Used in agricultural area; F. Storage of waste, G. Other – please specify).

Type of waste	Waste treatment
Wastewater	
Solid waste	
Waste sludge from the wastewater treatment	
Others, please specify:	

7. Stockpiles of fire-fighting foam and waste containing FPOS, PFOA, their salts or precursors.

Name of waste or No. of fire-fighting foam in Section 2.	Storage conditions	Location (Address)	For stored waste		
			Amount of waste (weight)	Name of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)

Name of waste or No. of fire-fighting foam in Section 2.	Storage conditions	Location (Address)	For stored waste		
			Amount of waste (weight)	Name of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (%)

8. Have the sites, where fire-fighting foam has been used, been investigated?

Yes ☐ No ☐ Don't know ☐

If Yes:

Location (Address)	Name of fire-fighting foam used at the location (Producer, trade name, etc.)	Levels of PFOS, PFOA, their salts or precursors at the site (levels in soil, water or sediments; µg/L or µg/kg)

9. Name of supplier of the fire-fighting foam used.

Name of company	Product	Contact information

10. Remarks.

11. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 12: Questionnaire for waste treatment facilities

Note: This questionnaire collects information related to PFOS, PFOA, their salts and precursors.
For more entries in the tables, please attach a list.
Thank you for your cooperation.

1. Name and address.

Name of organization	Address

2. Please indicate the type of waste management facility you operate.

(a) Landfill ☐
(b) Municipal solid waste incinerator ☐
(c) High-temperature incinerator ☐
(d) Wastewater treatment facility ☐
(e) Others, please specify ☐

3A. If you operate a wastewater treatment plant, please indicate what type of wastewater you receive.

(a) Industrial wastewater Yes ☐ No ☐
(b) Wastewater from households Yes ☐ No ☐

3B. How do you manage sewage sludge?

(a) Deposited on agriculture land	☐	(b) Destroyed in a waste treatment facility	☐
(c) Sent to a landfill (name/address):	☐	(d) Other (please specify) _____	☐

3C. To your knowledge, does the sewage sludge contain PFOS, PFOA, their salts or precursors?

Yes ☐ No ☐ Don't know ☐

If yes, please specify

Name of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors in the sludge (wt %)	Annual amount of PFOS, PFOA, their salts or precursors (weight)

3D. To your knowledge does the raw wastewater or treated wastewater contain PFOS, PFOA, their salts or precursors?

Yes ☐ No ☐ Don't know ☐

If yes, please specify

Name of PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors in raw wastewater (wt %)	Content of PFOS, PFOA, their salts or precursors in treated wastewater (wt %)	Annual amount of wastewater treated (weight/volume)

3F. Please name the supplier of the wastewater you deal with.

Name of company	Wastewater type	Contact information

4A. If you operate landfills or incinerators, please indicate what kind of waste products you accept/receive.

(c) Furniture Yes □ No □
(d) Shoes Yes □ No □
(e) Leather Yes □ No □
(f) Textiles Yes □ No □
(g) Clothing and apparel Yes □ No □
(h) Synthetic carpets Yes □ No □
(i) Industrial and household cleaning products Yes □ No □
(j) Biocide Yes □ No □
(k) Chemical stockpiles Yes □ No □
(l) Industrial waste Yes □ No □
(m) Fire-fighting foam Yes □ No □
(n) Electronics Yes □ No □
(o) Photos and films Yes □ No □
(p) Other (specify): Yes □ No □

4B. Are you aware if any of the products that you store or incinerate contain or have been surface treated with PFOS, PFOA, their salts or precursors?

Yes □ No □ Don't know □

If yes please specify.

Type of product	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (wt %)	Annual amount of PFOS, PFOA, their salts or precursors (weight)

Type of product	Name of contained PFOS, PFOA, their salts or precursors	Content of PFOS, PFOA, their salts or precursors (wt %)	Annual amount of PFOS, PFOA, their salts or precursors (weight)

4C. Please name the supplier of the waste you deal with

Name of company	Waste	Contact information

5. Remarks.

6. Respondent.

Name	
Department	
Position	
Telephone	
Mobile Phone	
Email Address	
Signature	
Date	

Appendix 13: Reporting format

Category of chemical agent used in industrial process/ articles or chemical products	Years of Inventory	Identified process-steps/chemical used (name/CAS nr)	Content of PFOS or ist related substances (wt %)	Annual amount of PFOS in chemical products (preparation or agent) and/or articles or used in industrial processes (kg/year)						
				Imported	Produced	Used in Industrial processes	In articles and chemical products on the market	Exported	Stockpiled	Waste
Acceptable purposes										
Chemical agent used in photo-imaging										
Photo-resist and anti-reflective coatings for semi-conductors										
Etching agent for compound semiconductors and ceramic filters										
Aviation hydraulic fluids										
surfactant/wetting agent/mist suppressants used in Metal plating (hard metal plating) only in closed-loop systems										
Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters)										
Fire-fighting foam										
Insect baits for control of leaf-cutting ants from *Atta spp.* And *Acromyrmex spp.*										
Specific exemptions										
Photo masks agent in the semiconductor and liquid crystal display (LCD) industries										
surfactant/wetting agent/mist suppressants used in metal plating (hard metal plating)										
surfactant/wetting agent/mist suppressants used in metal plating (decorative plating)										
Electric and electronic parts for some colour printers and colour copy machines										
Insecticides for control of red imported fire ants and termites										
Agent used for chemically driven oil production										
Carpets										
Leather and apparel										
Textiles and upholstery										
Paper and packaging										
Coatings and coating additives in wax, polishes and paints										
Rubber and plastics										
Acceptable purposes/specific exemption*										
Production of PFOSF, PFOS and its related substances										
Production of other chemical agents, impregnation formulas and mixtures used in manufacture of articles and products										
Examples of banned categories										
Industrial and household cleaning agents such as - Water proof spray · Denture cleanser · Shampoos · Cleaning agents · Cosmetics and hand cream · Toner and printing ink · Sealants and adhesive agents										
Articles from recycled synthetic carpets										
Oils from downcycled aviation hydraulic fluids										
Articles from recycled paper and packaging										
Industrial and household treatment products such as - Water proof spray · Denture cleanser · Shampoos · Cleaning agents · Cosmetics and hand cream · Toner and printing ink · Sealants and adhesive agents										
Edge bead removers, de-gluing agents, developing agent used in semiconductor industry										
Desmear agent, dispersion agent, surface treatment agent, solder, paint, and adhesive used in electronic industry										
Surfactants in mining industry										

Appendix 14: Compilation format

Category of chemical agent used in industrial process	Years of Inventory	Identified process-steps/chemical agent used	Imported			Produced			Used in manufacturing of articles			Exported			Stockpiled			Waste		
			Yi	L	Ti	P	L	Tp	C	L	Tc	Ye	L	Te	Ys	L	Ts	Yw	L	Tw
			Chemical agent (kg/year)	PFOS concen-tration (wt %)	Annual amount PFOS (kg/year)	Production of Chemical agent (kg/year)	PFOS concen-tration (wt %)	Annual amount PFOS (kg/year)	Consumption of chemical agent (kg/year)	PFOS concen-tration (wt %)	Annual amount PFOS (kg/year)	Chemical agent (kg/year)	PFOS concen-tration (wt %)	Annual amount PFOS (kg/year)	Chemical agent (kg/year)	PFOS concen-tration (wt %)	Annual amount PFOS (kg/year)	Chemical agent (kg/year)	PFOS concen-tration (wt %)	Annual amount PFOS (kg/year)
Acceptable purposes																				
Chemical agent used in photo-imaging																				
Photo-resist and anti-reflective coatings for semi-conductors																				
Etching agent for compound semiconductors and ceramic filters																				
surfactant/wetting agent/mist suppressants used in Metal plating (hard metal plating) only in closed-loop systems																				
Specific exemptions																				
Photo masks agent in the the semiconductor and liquid crystal display (LCD) industries																				
surfactant/wetting agent/mist suppressants used in metal plating (hard metal plating)																				
surfactant/wetting agent/mist suppressants used in metal plating (decorative plating)																				
Agent used for chemically driven oil production																				
Manufacture of Rubber and plastics																				
Acceptable purposes/specific exemption*																				
Production of PFOSF, PFOS and its related substances																				
Production of other chemical agents, impregnation formulas and mixtures used in manufacture of articles and products																				
Examples of banned categories																				
Edge bead removers, de-gluing agents, developing agent used in semiconductor industry																				
Desmear agent, dispersion, surface treatment, solder, paint, and adhesive used in electronic industry																				
Surfactants in mining industry																				

Category of article or chemical product	Years of Inventory	Name of Chemical (CAS nr)	Imported			Produced			On the market			Exported			Stockpiled			Waste		
			Yi	L or AW	Ti	P or M	L or AW	Tp or Tm	S	AW	Ts	Ye	L or AW	Te	Ys	L or AW	Ts	Yw	L or AW	Tw
			Article or chemical product (kg/year)	PFOS concent-ration (wt%)	Annual amount PFOS (kg/year)	Article or chemical product (kg/year)	PFOS concent-ration (wt%)	Annual amount PFOS (kg/year)	Article or chemical product (kg/year)	PFOS concent-ration (wt%)	Annual amount PFOS (kg/year)	Article or chemical product (kg/year)	PFOS concent-ration (wt%)	Annual amount PFOS (kg/year)	Article or chemical product (kg/year)	PFOS concent-ration (wt%)	Annual amount PFOS (kg/year)	Article or chemical product (kg/year)	PFOS concent-ration (wt%)	Annual amount PFOS (kg/year)
Acceptable purposes																				
Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters)																				
Fire-fighting foam																				
Aviation hydraulic fluids																				
Insect baits for control of leaf-cutting ants from *Atta spp.* And *Acromyrmex spp.*																				
Specific exemptions																				
Electric and electronic parts for some colour printers and colour copy machines																				
Insecticides for control of red imported fire ants and termites																				
Carpets																				
Leather and apparel																				
Textiles and upholstery																				
Paper and packaging																				
Coatings and coating additives in wax, polishes and paints																				
Examples of banned categories																				
Articles from recycled synthetic carpets																				
Oils from downcycled aviation hydraulic fluids																				
Articles from recycled paper and packaging																				
Industrial and household treatment products such as - Water proof spray - Denture cleanser - Shampoos - Cleaning agents - Cosmetics and hand cream - Toner and printing ink - Sealants and adhesive agents																				