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Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants
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Matters related to the implementation of the Convention: measures to reduce or eliminate releases from intentional production and use: perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride

Report on the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride

Note by the Secretariat

As is mentioned in the note by the Secretariat on the evaluation of perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride pursuant to paragraphs 5 and 6 of part III of Annex B to the Stockholm Convention (UNEP/POPS/COP.11/7), the annex to the present note sets out a report on the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride prepared by the Secretariat. The present note, including its annex, has not been formally edited.

* UNEP/POPS/COP.11/1.

Annex

Report on the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride

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1. Introduction

1.1. Background and objectives

1. At its fourth meeting in 2009 (COP-4), the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants, by decision SC-4/17, listed perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) in Annex B to the Convention.

2. At its ninth meeting in 2019 (COP-9), the Conference of the Parties, by decision SC-9/4, amended the listing for PFOS, its salts and PFOSF in Annex B to the Convention as follows, taking into account the reports submitted by the POPs Review Committee[1] and the Secretariat[2] and the recommendations by the Committee.[3] The listing of PFOS, its salts and PFOSF, including the acceptable purposes and specific exemptions adopted in decisions SC-4/17 (COP-4 amendment) and SC-9/4 (COP-9 amendment) can be found in Tables 1 and 2 below, respectively.

Table 1. Listing of PFOS, its salts and PFOSF in Annex B to the Stockholm Convention adopted in decision SC-4/17 (COP-4 amendment)

Chemical	Activity	Acceptable purpose or 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 perfluorosulfonate (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:** In accordance with part III of this Annex, production of other chemicals to be used solely for the uses below. Production for uses listed below. **Specific exemption:** As allowed for Parties listed in the Register.
	Use	**Acceptable purpose:** In accordance with part III of this Annex for the following acceptable purposes, or as an intermediate in the production of chemicals with the following acceptable purposes: • Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • 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 exemption:** For the following specific uses, or as an intermediate in the production of chemicals with the following specific uses: • Photo masks in the semiconductor and liquid crystal display (LCD) industries • Metal plating (hard metal plating) • 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 • Chemically driven oil production • Carpets • Leather and apparel • Textiles and upholstery • Paper and packaging • Coatings and coating additives • Rubber and plastics

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

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

[3] Decision POPRC-14/3.

Table 2. Listing of PFOS, its salts and PFOSF in Annex B to the Stockholm Convention adopted in decision decision SC-9/4 (COP-9 amendment)

Chemical	Activity	Acceptable purpose or 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:** In accordance with part III of this Annex, production of other chemicals to be used solely for the use below. Production for uses listed below. **Specific exemption:** None
	Use	**Acceptable purpose:** In accordance with part III of this Annex for the following acceptable purpose, or as an intermediate in the production of chemicals with the following acceptable purpose: Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from *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 this Annex

3. According to paragraph 5 of part III of Annex B to the Convention, the Conference of the Parties should evaluate the continued need for PFOS, its salts and PFOSF for the acceptable purposes and specific exemptions listed above, based on available scientific, technical, environmental and economic information. As stated in paragraph 6 of part III of Annex B to the Convention, the evaluation shall take place no later than in 2015 and every four years thereafter, in conjunction with a regular meeting of the Conference of the Parties.

4. The present report is prepared by the Secretariat, in accordance with the process set out in the annex to decision SC-6/4 and the revised schedule set out in the annex to decision SC-7/5 to contribute to the third evaluation pursuant to paragraphs 5 and 6 of part III of Annex B to the Convention to take place at the eleventh meeting of the Conference of the Parties.

1.2. Sources of information

5. The main sources of information of the present report are the following:

(a) Information submitted in the national reports pursuant to Article 15, in particular part D of the reporting format (Information from the fifth national reports was extracted on 5 September 2022. Submissions after this date are not considered in this report);[4]

(b) Information available in the national implementation plans transmitted by Parties pursuant to Article 7 of the Convention;[5]

(c) Information available in the register of specific exemptions[6] and acceptable purposes;[7]

(d) Information on PFOS, its salts and PFOSF and sulfluramid submitted by Parties and observers in response to the call for information in 2022 following decision PORPC-17/8;[8] and,

(e) The previous report on the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (UNEP/POPS/COP.9/INF/12).

[4] http://ers.pops.int/eRSodataReports2/ReportSC_DashBoard.html.

[5] http://chm.pops.int/tabid/253/Default.aspx.

[6] http://chm.pops.int/tabid/4644/Default.aspx.

[7] http://chm.pops.int/tabid/794/Default.aspx.

[8] http://chm.pops.int/tabid/9096/Default.aspx.

2. Entry into force and obligations of the Stockholm Convention

6. The Stockholm Convention on Persistent Organic Pollutants entered into force on 17 May 2004. The amendments adopted at COP-4 entered into force for most Parties on 26 August 2010 and the amendments adopted at COP-9 on 3 December 2020.[9]

7. As of 1 February 2023, the number of Parties to the Convention is 186; the COP-4 amendment has come into for force for 178 Parties and the COP-9 amendment for 171 Parties.

(a) According to Article 7 and decisions taken by the Conference of the Parties, each Party shall develop and endeavour to implement a plan for the implementation of its obligations under the Convention; transmit its implementation plan to the Conference of the Parties within two years of the date on which the Convention enters into force for it; and review and update, as appropriate, its implementation plan, including to reflect the amendments to the annexes to the Convention within two years from the date of entry into force for it.

(b) According to Article 15 and decisions taken by the Conference of the Parties, each Party shall, every four years, report to the Conference of the Parties on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention.

8. The number of submissions by Parties of national implementation plans (NIP) pursuant to Article 7 addressing the amendments relevant to PFOS, its salts and PFOSF and national reports pursuant to Article 15 are summarized in Table 3 below.

Table 3. Number of submissions by Parties of national implementation plans pursuant to Article 7 addressing the amendments relevant to PFOS, its salts and PFOSF and national reports pursuant to Article 15 (as of 1 February 2023)

NIP/national reports	Number of submissions by Parties
NIP addressing COP-4 amendment	108
NIP addressing COP-9 amendment	14
National reporting-1 (2006)	45
National reporting-2 (2010)	95
National reporting-3 (2014)	93
National reporting-4 (2018)	88
National reporting-5 (2022)	81

[9] Amendments to Annex A, B or C to the Convention enter into force on the expiry of one year from the date of communication by the depositary of such amendments for all Parties except those that 1) have submitted a notification of non-acceptance of the amendment in accordance with Article 22 paragraph 3 (b) of the Convention (referred to as "opt-in" Parties); or 2) that have made a declaration with respect to those Annexes in accordance with Article 25 paragraph 4 (referred to as "opt-out" Parties), in which case any such amendment shall enter into force for such Party on the ninetieth day after the date of deposit with the depositary of its instrument of ratification, acceptance, approval or accession with respect to such amendment, in accordance with Article 22 paragraph 4 of the Convention. As of 1 September 2022, there are 18 "opt-in" Parties and 3 Parties that opted out of amendments have since withdrawn their notifications of non-acceptance.

3. Register of acceptable purposes and specific exemptions for PFOS, its salts and PFOSF

9. The acceptable purposes and specific exemptions as adopted in decisions SC-4/17 and SC-9/4 can be found in Tables 1 and 2 above, respectively.

10. In accordance with paragraph 4 of Article 4 of the Convention, unless an earlier date is indicated by a Party, or an extension is granted pursuant to paragraph 7 of Article 4, the registration of specific exemptions shall expire five years after the date of entry into force of the amendment to that Party.

11. At its seventh meeting, the Conference of the Parties noted, pursuant to paragraph 9 of Article 4, that as there were no longer any Parties registered for specific exemptions for the production and use of PFOS, its salts and PFOSF for 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.[10]

12. For the acceptable purposes, in accordance with paragraph 1 of Part III of Annex B, a register of acceptable purposes is established. The Secretariat maintains the register of acceptable purposes. In the event that a Party not listed in the register determines that it requires the use of PFOS, its salts and PFOSF for the acceptable purposes listed in part I of Annex B, it shall notify the Secretariat as soon as possible in order to have its name added forthwith to the register.

13. Tables 4, 5, 6 and 7 below provide information contained in the register of acceptable purposes, withdrawal from the register of acceptable purposes and the register of specific exemptions for PFOS, its salts and PFOSF, respectively, as of 1 February 2023. The information on various exemptions is available on the website of the Convention.[11]

14. As of 1 February 2023, Brazil and Viet Nam are registered for the use of PFOS, its salts and PFOSF for the acceptable purpose (Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only). Canada and China have registered for multiple acceptable purposes adopted in decision SC-4/17.[12] The COP-4 amendment relevant to PFOS, its salts and PFOSF (decision SC-4/17) has entered into force for Canada and China on 4 April 2011 and 26 March 2014, respectively, while the COP-9 amendment relevant those chemicals (decision SC-9/4) has not entered into force for those countries as of 1 February 2023.

15. For specific exemptions, Norway, Switzerland and Viet Nam are registered for the use of PFOS, its salts and PFOSF for metal plating; and only Viet Nam is registered for fire-fighting foam for liquid fuel vapor suppression and liquid fuel fires (Class B fires) in installed systems, including both mobile and fixed systems).

[10] Decision SC-7/1.

[11] http://chm.pops.int/tabid/789/Default.aspx.

[12] Canada: photo-imaging; photo-resist and anti-reflective coatings for semi-conductors; etching agent for compound semi-conductors and ceramic filters; aviation hydraulic fluids; metal plating (hard metal plating) only in closed-loop systems; fire-fighting foam. China: photo-imaging; photo-resist and anti-reflective coatings for semi-conductors; etching agent for compound semi-conductors and ceramic filters; aviation hydraulic fluids; metal plating (hard metal plating) only in closed-loop systems; fire-fighting foam.

Table 4. Register of acceptable purposes for PFOS, its salts and PFOSF, as of 1 February 2023[13]

Party	Production notifications (x=received)		Use notifications (x=received)		Acceptable purpose activities	Chemical name of the precursor (if relevant)	Date of notification	Remarks
	Ongoing	Planned	Ongoing	Planned				
Acceptable purposes under amendment decision SC-9/4 (COP-9 amendment)								
Brazil	-	From Sep 2020	X	-	Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only.	Perfluorooctane sulphonyl fluoride (PFOSF) (CAS No. 307-35-7)	27/11/2020	Used as an intermediate in the production of insect baits with sulfluramid for the control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only.
Viet Nam	-	-	X	-	Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only.	N-Ethylperfluorooctane-1-sulfonamide (CAS No. 4151-50-2)	30/08/2022	Since 2020, Viet Nam has internalized the requirements on POPs management of the Stockholm Convention in Viet Nam's environmental protection legislation. The PFOS management has been regulated under the Law on Environmental Protection 2020 and the Decree No. 08/2022/ND-CP dated 10th January 2022 of the Government guiding the implementation of the Law on Environmental Protection 2020 that purpose is to protect human health and the environment from POPs' adverse impact. Besides, Viet Nam has regulated and implemented to control and monitor for the PFOS and articles, products, equipment containing PFOS under the Circular No. 10/2021/TT-BTNMT dated 30th June 2021 of the Minister of National Resources and Environment on environmental monitoring techniques and management of environmental quality monitoring information and data, including the techniques for monitoring of the POPs (including

[13] http://chm.pops.int/tabid/794/Default.aspx.

Party	Production notifications (x=received)		Use notifications (x=received)		Acceptable purpose activities	Chemical name of the precursor (if relevant)	Date of notification	Remarks
	Ongoing	Planned	Ongoing	Planned				
								12 old POPs and 18 new POPs, covering PFOS) in the environment components and in articles, products, commodities and equipment. At this time, Viet Nam is developing the draft National Technical Regulation on thresholds for POPs in articles, products, commodities and equipment aims to inspect and assess the quality of articles, products, commodities and equipment containing POPs, including PFOS. Viet Nam will continue to investigate, inventory, monitor, inspect and assess the PFOS and articles, products, commodities and equipment containing PFOS in conformity with the requirements of the Stockholm Convention in upcoming time.
Acceptable purposes under decision SC-4/17 (COP-4 amendment)[14]								
Canada			X	10/12/2010	• Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • Metal plating (hard metal plating) only in closed-loop systems • Fire-fighting foam		21/12/2010	
China	X		X		• Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors		18/03/2014	Applicable to Hong Kong SAR and Macau SAR of China.

[14] The COP-4 amendment relevant to PFOS, its salts and PFOSF (decision SC-4/17) has entered into force for Canada and China on 4 April 2011 and 26 March 2014, respectively, while the COP-9 amendment relevant those chemicals (decision SC-9/4) has not entered into force for those countries as of 1 February 2023.

Party	Production notifications (x=received)		Use notifications (x=received)		Acceptable purpose activities	Chemical name of the precursor (if relevant)	Date of notification	Remarks
	Ongoing	Planned	Ongoing	Planned				
					• Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • 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			

Table 5. Withdrawal from the register of acceptable purposes for PFOS, its salts and PFOSF, as of 1 February 2023[15]

Party	Activity	Date of notification	Date of withdrawal	Remarks at date of notification	Withdrawal notification
European Union	Production and use for: • Aviation hydraulic fluids	31/03/2011	09/06/2017	The EU restriction is not limited to PFOS, its salts and PFOSF but covers all PFOS derivatives defined as C8F17SO2X, X= OH, metal salt (O-M+), halide, amide, and other derivatives including polymers. Please note that the fire-fighting foams that were placed on the EU market before 27 December 2006 may be used until 27 June 2011.	Withdrawal notification - The European Union would now like to inform you that the production and use of PFOS for the acceptable purpose "aviation hydraulic fluids" is no longer required. Consequently, the European Union would like to withdraw the notification of the production and use of PFOS for the acceptable purpose "aviation hydraulic fluids" and would like to request you to delete that entry from the registry.
European Union	Production and use for: • Photo imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters	31/03/2011	17/07/2019	The EU restriction is not limited to PFOS, its salts and PFOSF but covers all PFOS derivatives defined as C8F17SO2X, X= OH, metal salt (O-M+), halide, amide, and other derivatives including polymers. Please note that the fire-fighting foams that were placed on the EU market before 27 December 2006 may be used until 27 June 2011.	Withdrawal notification - The European Union would now like to inform you that the production and use of PFOS for the following acceptable purposes is no longer required: • Photo imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters. Consequently, the European Union would like to withdraw the notification of the production and use of PFOS for the acceptable purposes listed above and would like to request the deletion of those entries from the registry.
Norway	Use for: • Aviation hydraulic fluids	28/10/2010	11/10/2017		

[15] http://chm.pops.int/tabid/794/Default.aspx.

Table 6. Acceptable purposes previously registered by Parties for which 2019 amendment entered into force[16]

Party	Production notifications (x=received)		Use notifications (x=received)		Acceptable purpose activities	Chemical name of the precursor (if relevant)	Date of notification	Remarks
	Ongoing	Planned	Ongoing	Planned				
Brazil	X		X		• Insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp.	Perfluorooctane sulphonyl fluoride (PFOSF) (*)	18/11/2010	(*) Intermediate in the production of sulfluramid, for the production of insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp.
Cambodia			X		• Fire-fighting foam	No specific chemicals identified in the NIP update.	20/01/2016	The needs for continued use of stockpiles of PFOS containing fire fighting foam was determined by our NIP update submitted to the Secretariat.
Czech Republic			X		• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only in closed-loop systems		11/08/2010	
European Union	X		X		• Metal plating (hard metal plating) only in closed-loop systems.		31/03/2011	The EU restriction is not limited to PFOS, its salts and PFOSF but covers all PFOS derivatives defined as $C_8F_{17}SO_2X$, X= OH, metal salt (O-M^+), halide, amide, and other derivatives including polymers. Please note that the fire-fighting foams that were placed on the EU market before 27 December 2006 may be used until 27 June 2011.
Japan	X		X		• Photo-imaging; • Photo-resistant and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Certain medical devices	Perfluotooctane-1-sulfonyl fluoride (PFOSF, CAS No. 307-35-7)	02/09/2010	

[16] http://chm.pops.int/tabid/794/Default.aspx.

Party	Production notifications (x=received)		Use notifications (x=received)		Acceptable purpose activities	Chemical name of the precursor (if relevant)	Date of notification	Remarks
	Ongoing	Planned	Ongoing	Planned				
Norway			X		• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Metal plating (hard metal plating) only in closed-loop systems.		28/10/2010	
Switzerland			X		• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids; • Metal plating (hard metal plating) only in closed-loop systems; • Fire-fighting foam.		15/03/2011	Although PFOS-based aqueous film forming foams (AFFFs) can no longer be manufactured, or purchased in Switzerland, remaining stocks are allowed to be used in cases of an emergency by fire brigades until 2014 and in stationary installations until 2018.
Republic of Korea			X		• Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • 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)		15/05/2018	
Türkiye			X		• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids;		12/05/2015	

Party	Production notifications (x=received)		Use notifications (x=received)		Acceptable purpose activities	Chemical name of the precursor (if relevant)	Date of notification	Remarks
	Ongoing	Planned	Ongoing	Planned				
					• Metal plating (hard metal plating) only in closed-loop systems.			
Viet Nam	X		X		• Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids; • 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.	• Perfluorooctane sulfonic acid (CAS No. 1763-23-1); • Potassium perfluorooctane sulfonate (CAS No. 2795-39-3); • Lithium perfluorooctane sulfonate (CAS No. 29457-72-5); • Ammonium perfluorooctane sulfonate (CAS No. 29081-56-9); • Diethanol-ammonium perfluorooctane sulfonate (CAS No. 70225-14-8); • Tetraethyl-ammonium perfluorooctane sulfonate (CAS No. 56773-42-3); • Didecyldimethyl-ammonium perfluorooctane sulfonate (CAS No. 251099-16-8) • Perfluorooctane sulfonyl fluoride (CAS No. 307-35-7).	16/04/2013	Viet Nam is in the process of PFOS inventory and will update information when available.
Zambia			X	30/05/2014	• Aviation hydraulic fluids; • Fire-fighting foam.	Zambia is currently conducting PFOS inventory. Information will be provided the inventory is completed.	02/05/2014	Zambia is currently conducting PFOS inventory. Information will be provided the inventory is completed.

Table 7. Register of specific exemptions for PFOS, its salts and PFOSF, as of 1 February 2023[17]

Party	Activity	Specific exemption	Expiry date	Estimated quantity of production / us	Purpose(s) of production / use	Reason for exemption
As adopted by decision SC-9/4 (From 3 December 2020 onwards)						
Norway	Use	Metal plating (hard-metal plating) only in closed-loop systems	02/12/2025	Not provided	Metal plating (hard-metal plating) only in closed-loop systems	Not provided
Switzerland	Use	Metal plating (hard-metal plating) only in closed-loop systems	02/12/2025	Not provided	Metal plating (hard-metal plating) only in closed-loop systems	Transition to alternatives not yet completed.
Viet Nam	Use	Metal plating (hard-metal plating) only in closed-loop systems	02/12/2025	Not provided	Metal plating (hard-metal plating) only in closed-loop systems	Currently Viet Nam has still used PFOS as the input materials for direct production and in the articles, products, commodities and equipment containing PFOS in several fields such as: metal plating, fire-fighting foam.
Viet Nam	Use	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 B	02/12/2025	Not provided	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 B	Currently Viet Nam has still used PFOS as the input materials for direct production and in the articles, products, commodities and equipment containing PFOS in several fields such as: metal plating, fire-fighting foam.

[17] http://chm.pops.int/tabid/4644/Default.aspx.

4. Production, use, import and export of PFOS, its salts and PFOSF

4.1. Production

16. The voluntarily phase out in 2003 of the production of PFOS, its salts and PFOSF by the most important global producer marked a major decrease in global production and use. Available information indicates that 3M was the main producer of PFOS, its salts and PFOSF until 2003, and that the production before 2003 was mostly for surface treatment and for paper protection (Carloni, 2009; UNECE, 2006). Since that time, China became a major producer of PFOS. According to the China Association of Fluorine and Silicone Industry, PFOS production in China fluctuated over the years with an estimated production of 26 tons in 2001 and 150 tons in 2012, with a peak in production of just under 250 tons in 2008 (Huang et al 2013).

17. Two Parties, Brazil and China, have registered for production of PFOS, its salts and PFOSF for the acceptable purposes under the Convention. Registrations for production for acceptable purposes have either expired or withdrawn for the European Union, Japan and Viet Nam. Registrations for production related to specific exemptions for China, European Union, Viet Nam have expired. However, Viet Nam newly register for an acceptable purpose and specific exemptions on 30 August 2022.

18. In their national reports, Belgium, China, Germany, Japan and the Russian Federation reported past production of PFOS, its salts and PFOSF. China reported that production started in 2001 and ceased in 2021. Germany reported that production started before 2001 and ended in 2015; Japan reported that production ended in 2010. In their response to 2018 call for information Germany indicated production was 9 tons/year until 2015, and zero in 2016. According to the fifth national report, production in the Russian Federation started in 2019 and ceased in 2020.

19. None of the Parties that responded to the 2022 call for information indicated any production of PFOS, its salts and PFOSF.

20. Further sector-specific details and quantitative annual production data are not available.

4.2. Use

21. Table 8 below provides the latest available information on the use of PFOS, its salts and PFOSF for the acceptable purposes and specific exemptions provided by Parties in their national reports, national implementation plans and responses to the calls for information in 2018 and 2022.

Table 8. Information on the use of PFOS, its salts and PFOSF for acceptable purposes and specific exemptions provided by Parties (source: national reports, national implementation plans and responses to the calls for information in 2018 and 2022)

Applications	Used in the past[18]	Currently used[19]	Never used or information not available
Acceptable purposes			
Insect baits for control of leaf-cutting ants from *Atta* spp. **and *Acromyrmex*** spp.	Bosnia and Herzegovina, Colombia, Guatemala, Nicaragua, Panama, Saint Lucia, Suriname Trinidad and Tobago	Brazil, Viet Nam	Armenia, Australia, Austria, Belarus, Belgium, Bolivia, Canada, Chile, Cyprus, Czech Republic, DRC, Denmark, El Salvador, Finland, Gambia, Germany, Georgia, Ghana, Guyana, Indonesia, Ireland, Japan, Kuwait, Madagascar, Norway, Monaco, Oman, North Macedonia, Myanmar, Pakistan, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Tanzania, Thailand, , United Arab Emirates, United Kingdom of Great Britain and Northern Ireland (UK), Yemen, Algeria, Cambodia , China, Cuba, France, Kiribati, Kyrgyzstan, Lebanon, Liberia, Malawi, Montenegro, Morocco, Mozambique, New Zealand, Republic of Korea, Republic of Moldova, Romania, Samoa, Sierra Leone, Slovenia, Spain, Solomon Islands, Sudan, Tuvalu

[18] Information on use by the Parties not registered in the relevant acceptable purposes or specific exemptions was assumed to be “used in the past”.

[19] Information on use by the Parties currently registered in the relevant acceptable purposes or specific exemptions was assumed to be “currently used”.

Applications	Used in the past[18]	Currently used[19]	Never used or information not available
Specific exemptions			
Metal plating (hard metal plating) only in closed-loop systems	Austria, Belgium, Canada, China, Czech Republic, Finland, Germany, Japan, New Zealand, Singapore, Slovenia, Sweden, Türkiye, UK	Australia , Norway, Switzerland, Türkiye, Viet Nam	Armenia, Belarus, Bolivia, Brazil, Chile, Cyprus, DRC, Denmark, El Salvador, Georgia, Guyana, Ireland, Kuwait, Lebanon, Madagascar, Monaco, Montenegro, Myanmar, Nicaragua, Oman, North Macedonia, Peru, Rwanda, Sao Tome and Principe, Serbia, Suriname, Tanzania, Thailand, , Trinidad and Tobago, United Arab Emirates, Yemen, Algeria, Bosnia and Herzegovina, Colombia, Cuba, France, Gambia, Ghana, Guatemala, Indonesia, Kiribati, Kyrgyzstan, Liberia, Malawi, Morocco, Mozambique, Pakistan, Panama, Republic of Korea, Republic of Moldova, Romania, Saint Lucia, Samoa, Sierra Leone, Solomon Islands, Spain, Sudan, Tuvalu
Fire-fighting foam	Algeria, Bosnia and Herzegovina, Cambodia, China, Czech Republic, Finland, Gambia, Germany, Ghana, Guatemala, Indonesia, Japan, Kiribati, Kuwait, Kyrgyzstan, Lebanon, Madagascar, Myanmar, New Zealand, Pakistan, Panama, Saint Lucia, Sierra Leone, Switzerland, Suriname, Tanzania	Australia, Viet Nam	Armenia, Belgium, Bolivia, Brazil, Chile, Cyprus, DRC, Denmark, El Salvador, France, Georgia, Guyana, Ireland, Norway, Monaco, Montenegro, Nicaragua, North Macedonia, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Thailand, Trinidad and Tobago, United Arab Emirates, UK, Yemen, Austria, Belarus, Canada, Colombia, Cuba, France, Liberia, Malawi, Morocco, Mozambique, Republic of Korea, Romania, Samoa, Slovenia, Solomon Islands, Spain, Tuvalu

4.3. Quantitative information on the production, use, import and export

22. China reported production of 22,000 kg of PFOS for fire-fighting foam in 2020 and the Russian Federation a total of 45 kg of PFOS between 2019 and 2020. In the responses to the call for information in 2018, Germany indicated production of 9,000 kg per year until 2015, and none in 2016. No other Parties have reported quantitative information on the production of PFOS, its salts and PFOSF in their national reports or national implementation plans.

23. Table 9 below summarizes the latest available quantitative information on the use, import and export provided by Parties in their national reports, national implementation plans and responses to the calls for information in 2018 and 2022.

Table 9. Quantitative information on the use, import and export of PFOS, its salts and PFOSF provided by Parties (source: national reports, national implementation plans and responses to the calls for information in 2018 and 2022)

Party	Use / Stockpiles	Import	Export
Albania	The national implementation plan (2017 update) indicates use of PFOS to be between 1,863.75 and 12,552.5 kg/year.		
Algeria	The 2015 inventory estimated 4,285.5 kg in use and 4852 Kg in stockpiles.		
Argentina	The national implementation plan (2017 update) estimates average amount of PFOS, its salts and PFOSF used to be 63.2 kg/year (63 kg for insecticide based on sulfluramid and 0.2 kg Metallic coatings).	The national implementation plan (2017 update) estimates 725 kg of sulfluramid imported in 2015.	2008: for use 151,132.5 kg to Bolivia and Uruguay. 2009: for use 118,600 kg to Uruguay. 2010: for use 47,259.3 kg to Bolivia and Uruguay. 2011: for use 84,716.7 kg to Paraguay and Uruguay. 2012: for use 82,339.5 kg to Uruguay. 2013: for use 40,902 to kg Uruguay. 2014: for use 48,025 to kg Uruguay. 2015: for use 31,650 to kg Uruguay. 2016: for use 31,650 to kg Uruguay. 2017: for use 36,813 to kg Uruguay. 2018: for use 13,392 to kg Uruguay. 2019: for use 37,236 to kg Bolivia and Uruguay. 2020: for use 62,740 to kg Uruguay. 2021: for use 0 to kg Uruguay.
Armenia	The national implementation plan (2017 update) estimates use of 19400 kg PFOS in 2012, ranging from a low of 530 in 1999 and a high of 20,510 kg in 2010.	The national implementation plan (2017 update) estimates PFOS content of imported goods as 19,220 kg in 2012.	The national implementation plan (2017 update) estimates PFOS content of exported goods as 1,360 kg in 2012.
Belarus	The 2018 national report indicates that the inventory did not identify any PFOS users or PFOS stockpiles. There is production of fluorine-containing fire-fighting foam, potentially containing PFOS. In a number of enterprises there are stockpiles of fluorine-containing film-forming foam, potentially containing PFOS–about 35 tons (2013), about 7.5 tons (2015) and about 132 tons (2017). Further investigation is required to confirm if PFOS is present in these products. The presence of PFOS is possible in imported goods.	Reports imports for use of 752 kg from Germany, 3 kg from the Russian Federation and 1 kg from another source in 2018, 10 kg from Poland in 2019 and 2,700 kg from China in 2020.	
Belgium	Reported 229 kg in 2013 for metal plating and hard metal plating (in closed loop systems).	Reported imports of 0.12 kg from Japan for use in 2013.	
Benin	The national implementation plan (2018 update) estimates quantities of PFOS in use and stocks: firefighting foam (194-583 kg in 2015); hydraulic fluids (unknown); lubricants (2,250- 4,500 kg/year); paper and cardboard	Extinctors and accessories: 582.63 kg Fire-fighting foam, imported from: United Arab Emirates, France, Switzerland, Ivory Coast,	

Party	Use / Stockpiles	Import	Export
	manufacturing) (1,436 kg/year); coatings: (11.6 kg/year) and an estimated use of 23 kg of sulfluramid in 2015.	Kuwait, Nigeria, South Africa, Ghana, Togo.	
Bosnia and Herzegovina	Reported estimated use in 2012: 4,000 kg for fire-fighting foam kg; 56,000 kg for insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp.;[20] 8,000 kg in carpets; 637 kg in textiles and upholstery; 26,000 for coatings and coating additive; and 10,000 for other uses.		
Brazil	Reported estimated use of PFOSF for the production of insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. at a constant level of around 50,000 kg per year from before 2009 to 2017 (range 45,894 to 56,817 kg), 25760 kg in 2018, 40,500 kg in 2019, 38,500 kg in 2020 and 32,200 kg in 2021. 1,876 kg/year was used in 2011 for hard metal plating.	Imports for use from China: 2013: 50,000 kg 2014: 50,000 kg 2015: 47,267 kg 2016: 56,817 kg 2017: 63,760 kg 2018: 33,450 kg 2019: 40,500 kg 2020: 38,500 kg 2021: 32,200 kg	
Bulgaria	The 2012 national implementation plan update identified 8,100 kg of firefighting foam (6% PFOS) wastes.		Reported export of an approximately 4,510 kg to The Netherlands for final disposal in 2012.
Cabo Verde	The national implementation plan (2017) estimates an average annual consumption of 4,530 kg for fire-fighting foam or approximately 68 kg of PFOS. In 2014 the amount of fire-fighting foam in stocks was 2,541 tons for an estimated 38,109 kg of PFOS.		
Cambodia	The national implementation plan (2015 update) identified 44,419 litres of firefighting foam in stock which may contain PFOS.		
Cameroon	The national implementation plan (2016 update) estimated the total quantity of PFOS in articles and stockpiles or wastes to range between 122,145 and 170,877 kg.	.	
Canada	Use of PFOS, its salts and compounds that contain one of the following groups: $C_8F_{17}SO_2$, $C_8F_{17}SO_3$ or $C_8F_{17}SO_2N$ (collectively referred to as PFOS) in Canada is prohibited by the *Prohibition of Certain Toxic Substances Regulations, 2012*, with a limited number of exemptions. The Regulations currently do not prohibit the use of: • PFOS or a product containing it if it is designed for use in photoresists or anti-reflective coatings for photolithography processes;	Importation of PFOS, its salts and compounds that contain one of the following groups: $C_8F_{17}SO_2$, $C_8F_{17}SO_3$ or $C_8F_{17}SO_2N$ (collectively referred to as PFOS) in Canada is prohibited by the *Prohibition of Certain Toxic Substances Regulations, 2012*, with a limited number of exemptions.	Since 2012, the *Export of Substances on the Export Control List Regulations* establish restrictions on the export of perfluorooctane sulfonates, perfluorooctane sulfonamide and perfluorooctane sulfonyls, which are listed on Part 2 of the Export Control List (ECL). A prior notification of export is required for all exports of substances listed on the ECL.

[20] While this amount was provided in the national report (fourth cycle) of Bosnia and Herzegovina as use for Insect baits for control of leaf-cutting ants, these ants are confined to Latin America and the southern part of the US (Simões-Gomes, et al (2017) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5416825/).

Party	Use / Stockpiles	Import	Export
	• PFOS or a product containing it if it is designed for use in photographic films, papers and printing plates; • PFOS in aqueous film forming foam (AFFF) present in a military vessel or military fire-fighting vehicle contaminated during a foreign military operation; • PFOS in AFFF at a concentration less than or equal to 10 ppm. Proposed amendments to the Regulations are expected to remove remaining exemptions, aligning with the PFOS listing, amended in 2019, under the Stockholm Convention. Canada has no further specific information on the uses mentioned above. However, AFFF containing PFOS have not been manufactured in the U.S. or Europe since 2002.[21] The major suppliers of AFFF in Canada were interviewed and they all indicated they no longer use C_8 fluorosufactants in their production process. It is estimated that these manufacturers make up 90-100% of the firefighting foam market in Canada. Globally, it is expected that the use of PFOS in the photographic sector is declining rapidly as users move further towards digital imaging. The amount (kg) of PFOS used in metal plating (hard metal plating) only in closed-loop systems was reported as follows: 2009: 28.78 2010: 25.82 2011: 5.64 2012: 8.75 2013: 1.64 2014: 0	The Regulations do not prohibit the import of: • PFOS or a product containing it if it is designed for use in photoresists or anti-reflective coatings for photolithography processes; • PFOS or a product containing it if it is designed for use in photographic films, papers and printing plates; • PFOS in aqueous film forming foam present in a military vessel or military fire-fighting vehicle contaminated during a foreign military operation. Proposed amendments to the Regulations are expected to remove remaining exemptions, aligning with the PFOS listing, amended in 2019, under the Stockholm Convention. Canada has no further specific information on the imports from the uses mentioned above. Note, the World Semiconductor Council (WSC) announced in 2017 that the use of PFOS in semiconductor manufacturing, including in photoresists and anti-reflective coatings for photolithography processes, had completely ceased.[22]	No notification of any export of Perfluorooctane sulfonates, perfluorooctane sulfonamide and perfluorooctane sulfonyls have been received, therefore the quantity exported from Canada is 0 kg.
China	China reported 22,000.00 kg of PFOS was used for fire-fighting foam in 2020.		2018: for use 125 kg to India.
Colombia	According to the fifth national report the following amounts of PFOS were used in insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. 2001: 12,000 2002: 25,000 2003: 16,950 2008: 54,000	Reports imports from Brazil of 54,000 kg in each of 2008, 2009, and 2011. Also 12,000 kg in 2001, and 16,945 kg in 2003, origin unknown.	

[21] Fire Fighting Foam Coalition (undated), *Fact Sheet on AFFF Fire Fighting Agents*. https://static.ewg.org/reports/2020/pfas-firefighter-timeline/2002-03-FFFC.pdf.

[22] World Semiconductor Council, (2017), *Joint Statement of the 21st Meeting of World Semiconductor Council (WSC)* – May 18, 2017, Kyoto, Japan http://www.semiconductorcouncil.org/wp-content/uploads/2017/05/21st-WSC-Joint-Statement-May-2017-Kyoto-Final1.pdf.

Party	Use / Stockpiles	Import	Export
	2009: 54,000 2011: 54,000 2012: 54,000 2017: 56,250 2018: 56,250 The national implementation plan (2017) estimates a total 4442 kg PFOS used in the production of carpets from 2002 to 2007. There was insufficient information to estimate the use or stockpiles of PFOS related to photo-imaging, the electronic industry, metal plating, fire-fighting foam, and insect baits (sulfluramid).		
Costa Rica	The national implementation plan (2015) indicates the 2013 POPs inventory did not identify any use of PFOS related to electronic components, metal plating, fire-fighting foams, food packaging, or carpets.	The national implementation plan (2015) indicates that since 2008, a total of 623 kg of sulfluramid have been imported.	
Côte d'Ivoire	The national implementation plan (2015) indicates that total use of PFOS in 2014 was between 115 and 1,122 kg. The largest amount of PFOS use was in hard metal plating, decorative plating, and rubber and plastic manufacturing (101 to 1014 kg).	The national implementation plan (2015) indicates that the total quantity of PFOS in imported article on the market was between 115 and 1,122 kg in 2014.	
Croatia	The second national implementation plan (2016) found no evidence of production of PFOS and its derivatives or any current use. There are no precise data on existing stocks or quantities of previously used foams that could contain PFOS.	The second national implementation plan (2016) found no evidence of import of PFOS.	The second national implementation plan (2016) found no evidence of export of PFOS.
Cuba	The most widespread use of PFOS has been in fire-fighting foams; data on quantities available,		
Czech Republic	No information is available on stocks. The national report (fourth cycle) has the following estimates of use: • In photo-imaging: 1,425 kg (before 2009), 200 kg (2009), 100 kg (2010), 200 kg (2011), 200 kg (2012), 100 kg (2013), 50 kg (2014) 100 kg (2015), 100 kg (2016), 0 kg (2017) and 0 kg (2018); • In fire-fighting foams–0 kg in 2012, 2013, 2014, and 2015.	No information is available on import.	
Denmark	Reported estimated use of 19 kg per year for 2010-2013 in metal plating (hard metal plating) in closed-loop systems, 40 kg in 2014 and 2015 and 0 kg in 2018.	Reported the following imports for use: 2010: between 10 to 28 kg from Germany 2011: 480 kg from Germany 2012: 0 kg 2013: 0 kg 2014: 40 kg (Other) 2015: 40 kg (Other)	

Party	Use / Stockpiles	Import	Export
European Union	As of July 2019, only the use as mist suppressant for non-decorative hard chromium (VI) plating in closed loop systems is still allowed. Estimates of use within the Union for 2013-2015 are dominated by use in the metal plating industry (~ 4 tonnes in 2013, 7 tonnes in 2014, ~200 kg in 2015), the photographic industry (several tens kg/year) and the semiconductor industry. No Member States (between 2013-2015) mentioned its use in hydraulic fluids in the aviation industry. Germany have reported using the most PFOS in both 2013 and 2014, followed by the Netherlands and Sweden who have reported using 150 kg and 140 kg in 2013, respectively. During the 2013-2015 reporting period use has fallen in Sweden (from 140 kg in 2013 to 25 kg in 2016), however the Netherlands have not updated their reporting since so current use is unknown, but it is expected to have decreased since 2009 (~390 kg). Germany indicate no further use of PFOS in 2015 however they are still producing approximately 9 tonnes per annum. PFOS has also been present in fire-fighting foams (90 t in stocks) although these stocks should have been destroyed by 27 June 2011. There are also historical stockpiles of PFOS from use in the photographic industry (1,280 kg) (ESWI 2011).	According to ESWI (2011): No information available, except for the photo industry: finished articles containing PFOS account for 150 kg/year.	Based on the information available in the annual report on PIC exports published in ECHA webpage[23]: • Less than 80 kg of PFOS have been exported from the EU in 2020; • PFOS has not been exported in 2019; • Less than 90 kg of PFOS have been exported from the EU in 2018. PFOS refer to Perfluorooctane sulfonic acid, Perfluorooctane sulfonates, Perfluorooctane sulfonamides and Perfluorooctane sulfonyls. The chemical identity of the substance(s) exported and the exact quantities exported is not publicly available.
Finland	Reported estimated use of 50 kg per year for 2009-2014 in hard metal plating in closed-loop systems, and 424 kg (2009), 400 kg (2010) and 400 kg (2011) for use as fire-fighting foam.		
Gambia	No information on quantities used or in stockpiles.		
Georgia		For the period 2006–2014 between 3,338 and 6,673 kg PFOS in aviation hydraulic fluid and between 1,647 and 19,776 kg PFOS in fire-fighting foam (2018 national implementation plan update).	
Germany	Reported estimated annual use in 2010 was of 75 kg in photo-imaging, 1.87 kg in photo-resist and anti-reflective coatings for semi-conductors, 50 kg in aviation hydraulic fluids, 3,400 kg in metal plating (hard metal plating) in closed-loop systems, and 25,000 kg in fire-fighting foam. Total use of PFOS in Germany in 2010: 28,527 kg. Use before 2009 was estimated at 916,384 kg for fire-fighting foam and 1,883 kg for hard metal plating in closed-loop systems.		2010: for use 4,182 kg to Argentina, Australia, Brazil, China, Republic of Korea, Malaysia, Singapore, Türkiye, United States of America, South Africa. 2011: for use 10,360 kg to Australia, Brazil, Switzerland, China, Republic of Korea, Malaysia, Singapore, Türkiye, United States of America, South Africa. 2012: for use 240 kg to South Africa 2013: for use 5,767 kg to Australia, Brazil, Switzerland, China, India, Republic of Korea,

[23] https://echa.europa.eu/regulations/prior-informed-consent/annual-reporting-on-pic-exports-and-imports.

Party	Use / Stockpiles	Import	Export
			Singapore, Thailand, Türkiye, United States of America, South Africa 2014: for use 2,359 kg to Australia, Bosnia and Herzegovina, Brazil, China, India, Republic of Korea, Singapore, Türkiye, United States of America, South Africa. 2015: for use 1,000 kg to United Arab Emirates, Australia, Switzerland, China, India, Republic of Korea, Singapore, Türkiye, United States of America, South Africa. 2016: for use 1,425 kg to Australia, Brazil, Switzerland, Republic of Korea, Türkiye, South Africa. 2017: for use 22.5 kg to Republic of Korea.
Ghana	The 2018 national implementation plan update estimated the following uses: • Fire-fighting foam between 134 and 402.5 kg PFOS; • Total historical use (20 years) between 593 kg to 1,779 kg PFOS in fire-fighting foam; • In stockpiles: between 321 and 964 kg PFOS.		
Guatemala	The 2016 inventory estimated a total use of 2,778 kg/yr (2013-2015 data): • Fire-fighting foam: 2,768 kg/yr; • Aviation hydraulic fluids: 9.5 kg/yr.		
Guinea	The national implementation plan (2016) identified the following stocks of PFOS: 4,680 kg in fire-fighting foam, 0.075 kg in aviation hydraulic fluids, and 2,820 kg in jet fuel.	The 2016 national implementation plan estimated between 224 and 2,315 tons of PFOS imported in articles in 2012 and between 161 tons and 1,576 tons in 2013.	
Guinea Bissau	The national implementation plan (2017) estimated the following amount of PFOS used in 2014: 6 kg in carpets, 300 kg in paints, 126 kg in insecticides, 28 kg in fire-fighting foams and 0.1 kg in cosmetics.		
Honduras	The national implementation plan (2105 update) indicates an annual use of 44 kg PFOS and stocks of 752 kg in 2014. From 2009 to 2013, a total of 140,387.5 kg of sulfluramid was imported.		
Hungary	Hungary indicated that 0 kg of PFOS was used for fire-fighting foam in 2021.		
Indonesia	Reported an estimated annual use of 103,137 kg before 2009 increasing to 198,972 kg in 2012 as firefighting foam; reported use of 52 kg per year before 2009 and between 147-187 kg per year from 2009 to 2012 in the production of carpets; reported an annual use of 37,948 kg before 2009 increasing to 87,544 kg in 2012 in the production of textiles and upholstery;		

Party	Use / Stockpiles	Import	Export
	reported use of 94, 672 kg per year before 2009 and between 80,347-109,424 kg per year from 2009 to 2012 in the production of paper and packaging.		
Ireland	Reported estimated use for photo-resist and anti-reflective coatings for semi-conductors was of 2.6 kg in 2010, 0.4 kg in 2011, 0.3 kg in 2012 and 0 kg in 2013 and subsequent years.	Ireland reported imports for use: 2010: 2.209 kg from Belgium, UK, Japan 2011: 0.73 kg from Belgium 2012: 0.25 kg from Belgium	
Japan	According to the survey conducted by the relevant ministries, in March 2020, approximately 18 tons (amount of PFOS or its salts contained) of the foam extinguishing agents containing PFOS were identified (November 2020 national implementation plan update). In its fifth national report, Japan reports the following use (kg): • Photo-imaging: 400 (Before 2009); 3.32 (2009); • Photo-resist and anti-reflective coatings for semi-conductors: 5,500 (before 2009); 0 (2009); • Etching agent for compound semiconductors and ceramic filters: 0 (before 2009); 12.38 (2009).		Salts of perfluoro(octane-1-sulfonic acid)(CAS No. 1763-23-1) Exported to China as resist materials for semiconductors in FY2010. Exported amount is 2.058 kg (content in resist material).
Kenya	According to the fifth national report 1,500 was used in fire-fighting foams in 2014.		
Kiribati	According to the 2019 national implementation plan, some fire-fighting foam in Kiribati could contain PFOS.		
Kuwait	The 2021 national implementation plan indicates that PFOS foams were used in the past and that PFOS was most likely used in drilling and oil storing activities; sulfluramid is neither registered nor used in Kuwait.		
Kyrgyzstan	The 2016 national implementation plan update estimates a total of between 380,557 and 3,592,939 kg PFOS as follows: Electronic industry - Cell phones: 50–251 kg Electronic industry - VDT TV and PC: 4,209–21,046 kg Photographic industry: 100 kg Leather products: 1,2697–12,6973 kg Synthetic carpet coverings: 17,785–177,846 kg Synthetic padding and fabric: 90,121–901,214 kg Industrial and household surfactants 25,516–127,581 kg Hydraulic fluids: 843–1687 kg Fire-retardant foam: 8,002–24,005 kg The coating and impregnation of paper, cardboard and others: 221,234–2,212,337 kg		

Party	Use / Stockpiles	Import	Export
Lao People's Democratic Republic	The national implementation plan (2016 update) did not quantify the amount of PFOS in fire-fighting foam; hydraulic oil estimated to contain 0.05–0.09 kg of PFOS.	The national implementation plan (2016 update) estimated the amount of PFOS in imported textiles, fibres, carpets and leather products at 366,262 kg.	
Lebanon	The national implementation plan (2017 update) provides data from the inventory undertaken in 2016: An estimated 56 to 167 kg of PFOS in were released from the use of firefighting foams between 2004 and 2014; not possible to quantify PFOS use in synthetic carpets, textile and upholstery, and metal plating. No PFOS was used in leather tanneries, food packaging, paints, coatings and varnishes, aviation hydraulic fluids or in plastic and rubber products.		
Liberia	The 2018 national implementation plan did not identify any fire-fighting foam containing PFOS, Other uses could not be identified or confirmed.		
Madagascar	Reported use of 1,404 kg in fire-fighting foam and 10,500 kg in textiles and upholstery manufacture in 2014.	Reports import of 70,000 kg for use in 2014.	
Malawi	Due to insufficient data, the 2019-2023 national implementation plan was unable to determine quantities of products that could potentially contain PFOS.		
Maldives	Maldives (2017 NIP): There is no manufacture of articles and products using PFOS as a chemical and its related substances in the Maldives; it is possible that [imported] consumer articles may contain PFOS it is not possible to quantify this. It is not present in medical devices, coatings, paint or hydraulic fluids used in the aircrafts. Sulfluramid is not a permitted insecticide. The largest amount of PFOS and related substances in current use in the Maldives are in the form of fire-fighting foams; 1210 litres of AFFF have been used in cases of fire incidents from 2009 until end of 2013 and 1200 litres of AFFF are present in the stock as of 2013.		
Mexico	In its response to the 2018 call for information: 75 kg (2010); 135 kg (2011); 2,766.02 kg (2012); 1,696 kg (2013); 2,370.38 kg (2014); and 1,792.68 kg (2015).		
Monaco	This chemical is not used in Monaco.	This chemical is not imported in Monaco.	This chemical is not exported from Monaco.
Montenegro	The 2019 national implementation plan estimated the following quantities of PFOS in imported products in 2016: Surface coating, paint and varnishes: 5.8 kg Cleaning agents, waxes and polishes: 13.6–27.2 kg Toner and printing inks: 10.4 Industrial and household cleaning products: 10.9–21.8 kg Coating and impregnation of paper and packaging: 15.9–159 kg Coating and impregnation of synthetic carpets: 189 to 1,890 kg		

Party	Use / Stockpiles	Import	Export
	Coating and impregnation of textiles: 29.8 to 298 kg		
Morocco	The 2019 national implementation plan estimates the total use of PFOS at between 1,324.8 and 13,092 kg/yr in the following use categories: Photographic sector: 9.3 kg/yr Aviation hydraulic fluids: between 9.0 and 18.1 kg/yr Insecticides: 0 kg /yr Coating and impregnation: between 1,276.8 and 12,768.3 kg/yr Coatings and coating additive: between 29,6 and 296.3 kg/yr	Morocco reports as part of its national report on the unavailability of information on PFOS imports; imports of sulfonic compounds potentially containing PFOS have been of 36,000 kg between 2010 and 2012.	
Mozambique		Mozambique imported 700 kg of PFOS for the period 2010-2013 from South Africa. The total quantity of PFOS imported during the period 2013-2017 is approximately 2,517 tonnes.	
Myanmar	PFOS in fire-fighting foams or in imported textiles and synthetic carpets could not be quantified (2020 national implementation plan).		
Netherlands	The only use still allowed within the EU until 7 September 2025 is the following: If the quantity released into the environment is minimised, manufacturing and placing on the market shall be allowed until 7 September 2025 for use as mist suppressant for non-decorative hard chromium (VI) plating in closed loop systems. Provided that those Member States where PFOS is used report to the Commission by 7 September 2024 on progress made to eliminate PFOS and justify the continuing need for this use, the Commission shall review the need for a prolongation of the derogation for this use of PFOS for a maximum of five years by 7 September 2025. However, we do not have actual information on the current use but assume that PFOS has been replaced by other substances.		
Nicaragua		Reports imports from Brazil, 20,000 kg in each of 2017 and 2018.	
Nigeria	According to the fifth national report, 2,995,641 kg of PFOS were used in fire-fighting foam in 2017. The national implementation plan (2016 update) indicates that approximately 12,000 kg of AFFF foam are stockpiled.	The national implementation plan (2016 update) indicates that 2,983,641 kg was imported between 2011 and 2014.	
Norway	Reported 2 kg in each of 2015 and 2016 and 0 kg from 2017 onwards for metal plating (hard metal plating) only in closed-loop systems.	None.	None.
Pakistan	The 2020 national implementation plan notes that PFOS and related substances are not produced in Pakistan but are only imported in products (e.g., fire-fighting foam, aviation hydraulic fluid and PFAS containing pesticides. Sulfluramid is not registered for use.		

Party	Use / Stockpiles	Import	Export
Panama	The 2018 national implementation plan estimates the quantity of PFOS used at 8.69 tonnes per year: Aviation hydraulic fluids: 0.02 t Fire-fighting foams: 1.66 t Insecticides for control of red imported fire ants and termites: 0.23 t Carpets: 0.05 t Leather and apparel: 0.33 t Textiles and upholstery: 0.43 t Paper and packaging: 5.97 t Stocks: 1.63 t		
Paraguay	The national implementation plan (2017 update) identifies average annual consumption of 3,148,400 kg of PFOS in different consumer items (textiles and upholstery, paper and cardboard, cleaning products, toner and printer ink, etc.) and in fire-fighting foam, aviation hydraulic fluids and pesticides (sulfluramid). Stocks of PFOS are estimated at 21,465,000 kg.		
Republic of Korea	No use.	Perfluorooctane sulfonic acid CAS No. 1763-23-1: 2014: 0.000004 kg 2018: 0.01 kg	None
Romania	The national implementation plan (2012) identified the following quantities of PFOS in waste in 2009: 500 kg (elastic (rubber) materials), and 500 kg (carpets).		
Saint Lucia	According to the fifth national report 46.00 kg was used in fire-fighting foam in 2016. 46,783 L (48,186 kg) of PFOS/PFOS-related foam were in stock.	332 L (342 kg) of PFOS/PFOS-related foam was imported in 2016.	
Samoa	The 2019 national implementation plan estimates total PFOS use at between 248.9 and 2,474.5 kg/yr: Paper and packaging: 153.5-1,535 kg/yr Textiles, furniture, plastic and upholstery: 93.9-939.5 kg/yr; Toners and printing inks: 1.58 kg/yr.		
Sao Tome and Principe	In the 2015 inventory, the national implementation plan update reports 37-307 kg of PFOS in fire-fighting foams.		
Senegal	The national implementation plan (2016 update) estimates an annual PFOS consumption between 12,491 and 66,916 kg; stocks of PFOS would include between 979.9 and 9799 kg found in synthetic carpets and rugs.		
Seychelles	The national implementation plan (update) indicates that fire-fighting foam is the major use of PFOS. Stockpiles of firefighting foams are estimated to	The national implementation plan (update) indicates that 86.4 kg of PFOS were imported.	

Party	Use / Stockpiles	Import	Export
	contain 1,296 kg of PFOS; Quantities of PFOS in wastes/ contaminated sites are estimated at 80,988 kg.		
Sierra Leone	The 2019 update of the national implementation plan indicates that the quantity of PFOS used and released into the environment in 2016 was between 546.5 and 1,502 kg. The quantity in stockpiles was estimated to be between 388 and 1,164 kg in 2016 from the following users: Sierra Leone Fire Force (64.3–192.8 Kg), airports (42.8–128.5 kg), petroleum companies (64.2–198.9 kg), Sierra Leone Company to generate heat and power (EDSA&EGTC) (214.7–644.1 kg)		
Singapore	Reported the following use: an estimated 288 kg (2010), 470 kg (2011) and 50 kg (2012) in photo-resist and anti-reflective coatings for semi-conductors; 288 kg (2010), 470 kg 2011), 50 (2012) 150 (2013) and 0 kg (2014) in metal plating (hard metal plating) only in closed-loop systems.	Reported imports for use from China, Germany, India and/or USA of 574.25 kg in 2010, 940 kg in 2011, 100 kg in 2012, 150 kg in 2013, 400 kg in 2014. 400 kg from China in 2015, 0.013 kg from India in 2018, 0.0768 kg from China, India, USA in 2019, 0.013 from India and 0.033 from China, India in 2021.	2014: for use 400 kg to Malaysia. 2018: for use 0.013 kg to Thailand. 2019: for use 0.0768 kg to Philippines, Thailand and Viet Nam. 2020: for use 0.013 kg to Viet Nam. 2021: for use 0.033 kg, to Philippines and Viet Nam.
Slovenia	Reported estimated use of 480 kg in metal plating (hard metal plating) only in closed-loop systems before 2009, 117.5 kg in 2016 and 15 kg in 2017.		
Solomon Islands	According to the 2018 national Implementation plan the status of PFOS and PFOSF is unknown.		
South Africa		Reported imports of 75,357 kg for use in 2011 from Spain, India, Japan, Republic of Korea, and USA.	Estimated total export to Mauritius, Malawi, Zambia, and Zimbabwe of 74,720 kg for use in 2013.
Sudan	The national implementation plan (2014 update) estimates releases of between 166.56 and 499.7 kg of PFOS from the use of fire-fighting foam in 2012 and between 838.44 and 2,515.32 kg of PFOS in fire-fighting foam stockpiles. Use of PFOS in aviation hydraulic fluid in 2013 was between 127.25 and 254.48 kg; stockpiles of PFOS in aviation hydraulic fluids are estimated to be between 749.62 and 1,499.23 kg.		
Suriname	According to the 2019 national implementation plan, the total amount of all stored firefighting foam in Suriname is estimated at 275.6 tonnes (containing up to 1378 to 2756 kg of PFOS). Between 2006 and 2014. 15,000 kg sulfluramid with 0.5 % PFOS content (75 kg PFOS) were used. PFOS-treated textiles and papers that were produced before 2002 have largely reached their end-of-life and are in landfills and dumpsites.		
Sweden	Reported estimated use of PFOS in aviation hydraulic fluids was of 10 kg/year prior to 2013. The estimated use in hard metal plating in closed-loop	Sweden has an ongoing use of PFOS in hard metal plating, with an annual import of about 180 kilograms. Reported imports for	

Party	Use / Stockpiles	Import	Export
	systems was of 200 kg/year prior to 2010, 180 in 2011, 2012, and 2013, 80 in 2014, 60 in 2015, 25 in 2016, 0 in 2017, 10 in 2018, 0 in 2019 and 0 in 2020. Use before 2009 also included 100 kg for decorative metal plating, 200 kg for coatings and additives, 50 kg for leather and apparel, and 50 kg for other uses.	use from Germany of 180 kg in 2012 and 25 kg in 2016. In 2017 10 kg were imported for use (other).	
Switzerland	Reported the following use estimates: Photo-imaging–2011, 1 kg, 2012, 0 kg, 2013, 0 kg; Photo-resist and anti-reflective coatings for semi-conductors; Aviation hydraulic fluids; Etching agent for compound semiconductors and ceramic filters–0 kg in each of 2011, 2012, and 2013; Metal plating (hard metal plating) only in closed-loop systems–2011, 300 kg, 2012, 0.2 kg, 2013, 36 kg; Fire-fighting foam–2011, 6100 kg, 2012, 1000 kg, 2013, 736 kg. According to the NIP (FEON, 2012), apart from imports, stocks of PFOS may still be present in particular as fire-fighting foams. In 2005, estimates for stocks of PFOS in fire-fighting foams amounted to a total of approximately 15-18 tons. By the end of April 2012, the reports of the amounts of PFOS used for exempted purposes and stocks of PFOS containing fire-fighting foams for 2011 were received by the Federal Office for the Environment (FOEN). Based on a first evaluation of these data, 1000 tons of PFOS-containing firefighting foams and thus roughly 10 tons of PFOS were still stored in Switzerland in 2010. The difference to the estimates from 2005 may be due to notifications that are still missing and stocks that have been disposed of recently.	Reported imports for use from Germany of 100 kg in 2010, 50 kg in 2011; 600 kg in 2012 and 300 kg 2013 (for purpose of chromium plating).	
Tanzania	The 2018 national implementation plan indicates that no use of PFOS or related substances were identified in metal plating, paper and leather industries. A total of 57,045 litres of aqueous film-forming foam were found, most of which had been purchased after 2010.		
Trinidad and Tobago	Reported the following estimates of use: 50 kg (Before 2009), 50 kg (2009) and 50 kg (2010) in insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. No use reported in 2011–2014.		
Tunisia	The inventory of industry, manufactured products and articles, fire-fighting foams, and municipal and industrial wastes compiled for the national implementation plan (2017 update) estimates stocks of PFOS to be between 18,400 and 160,870 kg.		
Türkiye	There is no use of PFOS, its salts and PFOSF.	There is no import of PFOS, its salts and PFOSF.	There is no export of PFOS, its salts and PFOSF.
Tuvalu	The 2019 national implementation plan indicates that PFOS its salts and PFOSF are unlikely to be present in Tuvalu.		

Party	Use / Stockpiles	Import	Export
Uganda	The national implementation plan (2016 update) indicates there are between 401 and 1,204 kg of PFOS in fire-fighting foams stockpiles; the amount of foam disposed is 6–180 kg/year.	The national implementation plan (2016 update) estimates 8,830–84,880 kg of PFOS is imported per year, including 0.415–0.735 tons of fire-fighting foam.	
Uruguay	The 2015 PFOS inventory (see 2017 update of the national implementation plan) estimates: 2,000 kg of PFOS in stocks of fire-fighting foams; 4 kg of PFOS used in hydraulic fluids; a worst-case of 10 tons of PFOS in consumer products.		
UK	According the fifth national report, the following amounts (kg) were used in metal plating (hard metal plating) only in closed-loop systems: 131.00 (2015), 62.00 (2016), 120.23 (2017), 56.80 (2018), and 56.80 (2019). We have collated the relevant updated information from stockpile notifications for PFOS as follows: • 2018 (total 56.8 kg) PFOS (CAS No. n/a) PFOS added to chromic acid plating tanks as a mist suppressant. System is closed loop. Waste routes clearly defined and concentrations below any actionable level; • 2019 (total 56.8 kg) As above (same holder and material type/quantity); • 2020 (total 0.0 kg) Nil return.	Information supplied by HM Revenue and Customs indicates that in 2017 the UK arrived (imported) 2 kg of perfluorooctane sulphonic acid (PFOS) from Germany and 99,300 kg from Italy. In 2020 0.5 kg were imported for use from the Russian Federation.	Information supplied by HM Revenue and Customs indicates that in 2017 the UK has dispatched (exported) 30 kg of perfluorooctane sulphonic acid (PFOS) to Spain. In 2021, PFOS was exported for use, but the quantity and destination are unknown.
Viet Nam	The national implementation plan (2017 update) estimates the following PFOS use: 110-3,450 kg/year in textiles and upholstery, 200-4,800 kg/year in paper and paperboard, 62 kg/year in paints, solvents and other chemicals, and a total of 10,000-15,000 kg in fire-fighting foam (1998-2013).	Viet Nam has imported PFOS from many countries.	
Zimbabwe	The national implementation plan (2017 update) estimates that 11.6 kg PFOS were used in fire-fighting foam over a 20-years period; 0.56 kg PFOS are used annually for training; 258.4 kg PFOS are found in stocks of fire-fighting foam.		

5. Legal or administrative measures to restrict production and use of PFOS, its salts and PFOSF

24. According to paragraph 1 (b) of Article 3 of the Convention, each Party shall restrict its production and use of chemicals listed in Annex B in accordance with the provisions of that Annex.

25. Table 10 below provides a summary of the latest available information on legal or administrative measures to restrict the production and use of PFOS, its salts and PFOSF provided by Parties in their national reports and national implementation plans.

26. According to the information from the third, fourth and fifth national reports, 74 of 108 Parties that submitted national reports report that they had put in place any legal or administrative measures to address PFOS, its salts and PFOSF; one Party indicates that measures are in preparation, 10 indicate they have no measures in place. No information is available for the remaining 23 Parties.

Table 10. Information on legal or administrative measures to restrict the production and use of PFOS, its salts and PFOSF provided by Parties (source: national reports and national implementation plans)

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
Albania	Law No. 9263, dated 29.7.2004, "For Adherence of the Republic of Albania to the Stockholm Convention". Article 37 of Law No. 10431, dated 09.06.2011, "On environmental protection", bans production, import, placing on the market and use of chemicals and pesticides, which exhibit characteristics of persistent organic pollutants. Based on law 10463, dated 22.09.2011, "On integrated waste management", import or international transit movement of dangerous wastes into the Republic of Albania is prohibited. Export of hazardous wastes from Republic of Albania requires authorization by the Minister, based on the specific conditions requested. Currently, the Ministry of Environment is preparing a "Draft Decision on POPs" which will put in place specific measures regarding PFOS. Law No. 9108/2003 "On substances and chemical preparations" specifies that import and export of substances and dangerous preparations, must be made only with approval of the minister.
Algeria	No legal or administrative measures in place.
Antigua and Barbuda	Restriction in accordance with Annex B (2012).
Argentina	Restriction in accordance with Annex B (2018).
Armenia	Currently being developed.
Australia	Prohibition on imports and exports: "Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoridethe are listed in Regulation 11C of the Industrial Chemicals (Notification and Assessment) Regulations 1990, which prohibits introduction and export of: perfluorooctane sulfonic acid; perfluorooctane sulfonates, perfluorooctane sulfonamides and perfluorooctane sulfonyls, including the following: • Potassium perfluorooctane sulfonate; • Lithium perfluorooctane sulfonate; • Ammonium perfluorooctane sulfonate; • Diethanolammonium perfluorooctane sulfonate; • Tetraethylammonium perfluorooctane sulfonate; • Didecyldimethylammonium perfluorooctane sulfonate; • N ethylperfluorooctane sulfonamide; • N methylperfluorooctane sulfonamide; • N ethyl N (2 hydroxyethyl) perfluorooctane sulfonamide; • N (2 hydroxyethyl) N methylperfluorooctane sulfonamide; • Perfluorooctane sulfonyl fluoride; without approval."
Austria	Commission Delegated Regulation (EU) 2020/1203 of 9 June 2020 amending Annex I to Regulation (EU) 2019/1021 of the European Parliament and of the Council as regards the entry for perfluorooctane sulfonic acid and its derivatives (PFOS), OJ L 270 of 18 August 2020, pp. 1–3.
Belarus	Restriction in accordance with Annex B (2004) Decree of the President of the Republic of Belarus No. 594 26.12.2003 "On Acceding of the Republic of Belarus to the Stockholm Convention on Persistent Organic Pollutants" Prohibition on all uses (2006) Plant Protection Act of the Republic of Belarus, 25 December 2005 No. 77-3. The application of PFOSF is not permitted in accordance with State Register (http://www.ggiskzr.by/gosudarstvennyj_rees/). Prohibition on production (Before 2001) PFOS and PFOSF have never been produced in Belarus.

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
Belgium	Prohibition on production, import, export and all uses. Restricted according to Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants.
Belize	Restriction in accordance with Annex B. "Classified as a Restricted-Use Pesticide Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from Atta spp. and Acromyrmex spp. for agricultural use only."
Bolivia (Plurinational State of)	Prohibition on import (2005).
Bosnia and Herzegovina	Prohibition on production, import, export and all uses. Rulebook on conditions for restrictions and bans on the manufacture, placing on the market and use of chemicals (Official Gazette of the Republic of Srpska, no 100/10 and 63/13) (Annex II Part A). Decision on bans and restrictions on the import, manufacture, placing on the market and use of certain hazardous industrial chemicals in the Federation of Bosnia and Herzegovina (Official Gazette of the Federation of Bosnia and Herzegovina, no 52/16). The import, production, placing on the market and use of these substances, mixtures and articles containing these substances is prohibited, so as their export. By way of derogation of paragraph 1, import, production, placing on the market and use of tetrabromodiphenyl ether and pentabromodiphenyl ether shall be allowed for substances, mixtures, articles or as constituents of flame-retarded parts of articles which contain tetrabromodiphenyl ether or pentabromodiphenyl ether as impurity in concentrations equal to or below 10 mg/kg (0,001 % by weight). The import, production, placing on the market and use shall be allowed for mixtures and articles containing concentrations below 0,1% of tetrabromodiphenyl ether or pentabromodiphenyl ether by weight when produced partially or fully from recycled materials or materials from waste prepared for re-use. Restrictions referred to in paragraph 2 of this point shall not apply to electrical and electronic equipment, which is regulated by other legislation.
Brazil	Restriction in accordance with Annex B. There is no national legislation addressing restrictions on this chemical. However, its use is restricted to the production of sulfluramid, accordingly to the acceptable purpose registered. The legislation on sulfluramid was revised in 2014/2015 to allow its use only for control the species of ants indicated in the Stockholm Convention.
Bulgaria	Restricted in accordance with the Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III.
Burundi	Prohibition on import, export, and all uses (2001).
Cambodia	Prohibited production, import and export (2004).
Cameroon	Prohibition on production, imports and all uses (2011).
Canada	Prohibition on production, uses, import in accordance with Annex B (2008). The Regulations currently do not prohibit the use of: • PFOS or a product containing it if it is designed for use in photoresists or anti-reflective coatings for photolithography processes; • PFOS or a product containing it if it is designed for use in photographic films, papers and printing plates; • PFOS in aqueous film forming foam (AFFF) present in a military vessel or military fire-fighting vehicle contaminated during a foreign military operation; • PFOS in AFFF at a concentration less than or equal to 10 ppm. Proposed amendments to the Regulations are expected to remove remaining exemptions, aligning with the PFOS listing, amended in 2019, under the Stockholm Convention. "The Canadian Environmental Protection Act, 1999 (CEPA 1999) is the principle federal legislative tool for preventing pollution. CEPA provides legislative framework for the assessment and management of substances. CEPA ensures the protection of the environment and of the health of Canadians from harmful substances and other pollutants and provides the authority to restrict or eliminate production, use, import and export of toxic substances and products containing these substances. For additional information on this substance please see Canada's Update to its National Implementation Plan (April 2013). https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/update-national-implementation-plan-pollutants.html".
Central African Republic	No legal or administrative measures taken.
China	Restrictions in accordance with Annex B (2014).

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
	2014年《关于<关于持久性有机污染物的斯德哥尔摩公约>新增列九种持久性有机污染物的<关于附件A、附件B和附件C修正案>和新增列硫丹的<关于附件A修正案>生效的公告》2019年，《关于禁止生产、流通、使用和进出口林丹等持久性有机污染物的公告》.
Colombia	Restriction in accordance with Annex B (2008) La Ley 1196 DE 2008 se aprueba el "Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes" por medio del cual cada Parte Prohibirá y/o adoptará las medidas jurídicas y administrativas que sean necesarias para eliminar la producción, utilización, importaciones y exportaciones de los productos químicos enumerados en el anexo A con sujeción a las disposiciones que figuran en ese anexo; así mismo restringirá su producción y utilización de los productos químicos incluidos en el anexo B de conformidad con las disposiciones de dicho anexo.
Costa Rica	No legal or administrative measures taken.
Côte d'Ivoire	Prohibition on all uses.
Croatia	Restriction in accordance with Annex B (2012). Law on Ratification of the Stockholm Convention (OG-IT 2/2007). All updated national and EU legislations on POPs are available in the second national implementation plan for the Stockholm Convention on Persistent Organic Pollutants in the Republic of Croatia (2016). All updated national and EU legislations on POPs are available in the Second and Third NIP. Prohibition on production (2007). Regulation (EC) No 1907/2006 (REACH, includes possibility to restrict the use, placing on the market or production of substances by listing them in annex XVII and POP Regulation (EC) No 850/2004 on POPs which is legal instrument for implementing the Stockholm Convention and UNECE Protocol on POPs is directly applicable in all Member states of the EU. Export of POPs or articles containing POPs is regulated by Regulation (EC) No 689/2008 concerning export and import of the dangerous chemicals. National legislation concerning mentioned EU Regulations are implementing acts as follows: • Law on REACH Regulation implementation (OG 53/2008 and 18/2013); • Law on POP Regulation (OG 143/2013); • PIC Regulation is implemented by Law on PIC Regulation (OG 139/2010 and 25/2013).
Cuba	No legal or administrative measures in place.
Cyprus	Restricted in accordance with Annex B with production, import, export and use prohibited (2010). Included in Annex I, part A and Annex IV of European Regulation (EU)2019/1021 on persistent organic pollutants (listed 24 August 2010); Ratifying Law 2010.
Czech Republic	Restricted in accordance with Annex B (2009): Import, production and use of PFOS has been restricted since July 2009 by REACH regulation with some exemptions, which already were in line with SC exemptions https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009R0552. Currently these compounds are covered by different legislation - POPs regulation since August 2010 with the same exemptions https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32010R0757.
Democratic Republic of the Congo	No legal/administrative measures taken.
Denmark	Use and imports were prohibited in 2008. Restrictions in accordance with Annex B, prohibition of production and export were implemented in 2010. Today, chemical substances in Denmark are regulated under EU regulation 850/2004, implementing the Stockholm Convention and the UNECE POP-protocol. PFOS.
Ecuador	Under development (Amendment to Resolution 450 of the Committee on Foreign Trade).
Egypt	Use and imports are prohibited (2004). Prohibition on production. Egypt does not produce PFOSF.
El Salvador	Prohibition on production, import, export, and all uses before 2001. (Executive Agreement No. 151 by the Ministry of Agriculture and Livestock, 27 June 2000). Prohibition on import, export, and production (Executive Agreement No. 409, Ministry of the Environment and Natural Resources, of October 11, 2017. Published in the Official Gazette No. 210, Volume 417, of November 10, 2017).
Eritrea	Restricted in accordance with Annex B in 2013.
Estonia	Restriction in accordance with Annex B; prohibition on production, uses, import and export according to Commission Regulation (EU) No 757/2010 of 24 August 2010.
European Union	PFOS, its salts and PFOSF were initially restricted through the EU Directive 2006/122/EC which amended for the 30th time Council Directive 76/769/EEC. As of 1 June 2009, Annex XVII of the REACH Regulation (EC) No 1907/2006 replaced Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States, relating to restrictions on the marketing and use of certain dangerous substances and preparations. In March 201, PFOS, its salts and PFOSF were deleted from Annex XVII and are now regulated under Regulation (EC) No 850/2004 on

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
	persistent organic pollutants as amended by Commission Regulation (EU) No 757/2010 of 24 August 2010. According to the regulation, production, marketing and use of PFOS, alone, as well as contained, in mixtures or articles, may only take place in compliance with the restrictions set forth in the annex.[24] Production, marketing and use of PFOS may thus only take place for: (a) PFOS occurring as an unintentional trace contaminant in substances, preparations in concentrations of PFOS of 10 mg/kg (0.001% by weight) or less; (b) PFOS occurring as an unintentional trace contaminant in semi-finished products or products or parts thereof, if the concentration of PFOS is lower than 0.1% by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS, or for textiles or other coated materials, if the amount of PFOS is lower than 1 µg/m2 of the coated material; (c) Use of products already in use before 25 August 2010 and containing PFOS as a constituent is allowed; (d) Fire extinguishing foam placed on the market before 27 December 2006 may be used until 27 June 2011; (e) Until new information and safer alternative substances or technologies become available, if the quantity released into the environment is minimized, production and marketing is allowed for the following specific uses: (i) Until 26 August 2015: wetting agents for use in controlled electroplating systems; (ii) Photoresists or anti reflective coatings for photolithography processes; (iii) Photographic coatings applied to films, papers, or printing plates; (iv) Mist suppressants for non-decorative hard chromium plating in closed loop systems; (v) Hydraulic fluids for aviation. Where derogations in points (i) to (v) above concern the production or use in an installation within the scope of Directive 2008/1/EC of the European Parliament and of the Council, the relevant best available techniques for the prevention and minimization of emissions of PFOS described in the information of Directive 2008/1/EC shall apply. As soon as new information on details of uses and safer alternative substances or technologies for the uses in points (ii) to (v) becomes available, the Commission shall review the derogations in the second subparagraph so that the uses of PFOS will be phased out as soon as the use of safer alternatives is technically and economically feasible, a derogation can only be continued for essential uses for which safer alternatives do not exist and where the efforts undertaken to find safer alternatives have been reported on, releases of PFOS into the environment have been minimized by applying best available techniques. The export of POPs or articles containing POPs is regulated by Regulation (EU) No 649/2012 concerning the export and import of hazardous chemicals. This Regulation implements the Rotterdam Convention and provides for an export ban of POPs listed in Annex A and B of the Stockholm Convention and in Regulation (EC) No 850/2004. The decisions to list nine new substances in the Stockholm Convention were implemented by Regulation (EU) No 214/2011 and currently the export of all substances listed in Annexes A and B of the Stockholm Convention except PFOS is banned. The export of PFOS is currently still possible, but only on condition that the importing country consents to the import of that chemical.
Finland	Restricted in accordance with Annex B (2006): Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC.
France	Restriction in accordance with Annex B (2010).
Gambia	No legal or administrative measures in place.
Georgia	Prohibition on production, import, export and all uses.
Germany	Restricted in accordance with Annex B: Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:223:0029:0036:EN:PDF REMARKS: Allows production and use; Purposes of use - Metal plating (hard metal plating) and Metal plating (decorative plating). The EU restriction is not limited to PFOS, its salts and PFOSF but covers all PFOS derivatives defined as C8F17SO2X.
Ghana	Currently being developed. There are no specific laws for the control and management of PFOS/PFOSF in Ghana. However, some provisions under Act 490 and Act 917 are being used to manage PFOS/PFOSF in Ghana. There is also some collaboration among the Agency, Customs Division of the Ghana Revenue Authority and the Ghana National Fire Service in the importation,

[24] http://ec.europa.eu/enterprise/sectors/chemicals/reach/restrictions/index_en.htm.

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
	monitoring and the use of PFOS/PFOSF applications. Procedures and other capacities for PFOS/PFOSF waste including empty containers are lacking. A comprehensive legal framework needs to be developed for the control and management of the entire per and polyfluoroalkyl substances (PFAS), which include PFOS/PFOSF. As Ghana is a signatory to the Stockholm Convention, official importation of PFOS and related substances is prohibited since there are currently no exemptions listed.
Guatemala	No legal or administrative measures taken.
Guinea	Currently being developed.
Guyana	Prohibition of production, import, export and all uses (2017).
Honduras	No legal or administrative measures taken. Need for the adoption of measures identified in the national implementation plan.
Hungary	Restriction in accordance with Annex B; Prohibition on production; Prohibition on import (2010). Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III repealed by Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants. Prohibition on export (2012) Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of hazardous chemicals.
Indonesia	Under development: currently included as an active ingredient that is prohibited for all pesticide uses; listed in the draft regulation on hazardous substances management (to restrict its production, all uses, import and export).
Ireland	Prohibition on all uses (2010). See Regulation (EC) No 850/2004 as amended by Regulation (EU) No 757/2010 which has direct effect in Ireland.
Jamaica	No legal or administrative measures taken.
Japan	Production, import, export and all uses are prohibited (2010).
Kazakhstan	Imports and use of PFOS were prohibited in 2012. Law on Ratification of Stockholm convention (7 June 2007 No. 259) and Ecological Code (9 January 2007 No. 212) articles 239, 280, 288 and 298 banned production, use, import and export of POPs.
Kenya	Restriction in accordance with Annex B (before 2001).
Kiribati	No legal/administrative measures taken.
Kuwait	Kuwait has restricted the 21 POPs listed until COP4 in 2009 within Resolution No. 5 of 2016 in the executive regulations for chemicals management.
Kyrgyzstan	No legal/administrative measures taken.
Liberia	No legal/administrative measures in place
Latvia	Latvia prohibited all uses in 2010. See Regulation (EC) No 757/2010.
Lebanon	Restriction in accordance with Annex B (2002). See Law 432 dated 29/07/2002.
Lithuania	Restricted in accordance with Annex B. Imports were prohibited in 2008, production in 2010, and exports in 2014. Restrictions for the use of PFOS, its salts B, and other derivatives was introduced in 2007 by amendment of Hygienic Norm HN 36:2002. Effective from 2009, EU Regulation (EC) No 1907/2006 (Annex XVII) is applicable (as amended by Regulation 552/2009); from 2010 the production, placing on the market and use of PFOSs are regulated by Regulation (EC) 850/2004 (as amended by Regulation (EU) No 757/2010). Exemptions granted by the EU Regulation are significantly less numerous than in the Stockholm Convention. The export of PFOS is subject to provision provided for in Regulation (EU) No 649/212.
Luxembourg	Restriction in accordance with Annex B; Prohibition on production import export and all uses (2010).
Madagascar	No legal or administrative measures taken.
Malawi	Prohibition on all uses (2005).
Maldives	Prohibition on import and all uses.
Mali	No legal or administrative measures taken.
Mauritius	Prohibition on import (2009) Administratively the chemical is already prohibited through the Dangerous Chemicals Control Board.
Mexico	No legal or administrative measures taken.
Monaco	Restrictions in effect since 2004 are in accordance with Annex B.
Mongolia	Prohibited use (2010) and imports (2014).
Montenegro	All uses were prohibited in 2018. This POPs may be used, produced and place on the Market in accordance with the Decree on Prohibited or Permitted Methods of Use, Production and Placing on the Market of Chemicals That Represent an Unacceptable Risk to Human Health and the Environment

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
	(Official Gazette of Montenegro, No. 70/18). The Decree fully transposes Annexes I and II of the POPs Regulation as well as amendments to Annex XVII of the REACH Regulation (Regulation 519/2012 amending the POPs Regulation in relation to Annex I, Regulation 2016/293 amending the POPs Regulation in relation to Annex I).
Morocco	No legal or administrative measures in place.
Mozambique	Mozambique now is drafting and discussing the national chemical regulations including for POPs.
Myanmar	The 2020 national implementation plan identifies the following activity: raft regulations to prohibit/eliminate the production, use, import and export of listed POPs (considering exemptions).
Nepal	No legal or administrative measures taken.
Netherlands	Restricted in accordance with Annex B (2010): EU POP regulation (EC) 850/2004 governs the production, use and import of PFOS. Import is restricted for the purpose of uses still permitted under the regulation.
New Zealand	Restricted in accordance with Annex B (2016); prohibition on production, uses, import and export (2011).
Nicaragua	Prohibition on production import export and all uses (2001). Acuerdo Ministerial No. 23-2001.
Nigeria	Restriction in accordance with Annex B; Prohibition on production, import, export, and all uses (2018). National Committee on Chemicals Management 2019. Nigeria does not produce PFOS.
North Macedonia	Prohibition on import, export, on all uses (2009) Law on Plant protection products (Official Gazette No. 110/2007; 20/2009; 17/2011 и 53/2011); List of banning and restrictions for use of chemicals (Official Gazette No. 57/11, 67/12, 163/13, 31/14); Prohibition on production (2011). List of banning and restrictions for use of chemicals (Official Gazette No. 57/11, 67/12, 163/13, 31/14); Law on Plant protection products (Official Gazette No. 110/2007; 20/2009; 17/2011 и 53/2011). Production, import and export of articles and substances containing PFOS is allowed only if the concentration of PFOS does not exceed the corresponding limit values.
Norway	Restriction in accordance with Annex B (2018). For Metal plating (hard-metal plating) only in closed-loop systems. Prohibition on production, import, export, and all uses (before 2001). It has been regulated by the amendment of the EU POPs-regulation (EC) 850/2004, and later by its recast (EU) 2019/1021. In Norway, the EU POPs-regulation is implemented in Chapter 4 of the Product Regulations. As of 2007, the Norwegian product regulations prohibit fire-fighting foam that contains 0,001 per cent by weight or more of PFOS or PFOS related compounds. Fire-fighting foam that contains 0,001 per cent by weight or more of PFOS or PFOS related compounds is to be delivered to an approved facility for destruction. The Norwegian product regulations §2-30, and from November 2013 the Norwegian product regulation §4-2, prohibit exportation of PFOS. Regulatory measures and other measures taken by Norwegian authorities to reduce or eliminate emissions and releases of PFOS 2007- Product Regulations, Section 2-23: Ban of the use of PFOS in various products 2011 - Product Regulations, Section 2-9: Possession of PFOS containing fire-fighting foam was banned 2013 - Product Regulations, Section 2-9: Possession of PFOS containing fire-fighting foam was banned As of 2013 - Product Regulations, Section 4-1 implementing the amendment to the EU POPs Regulation (EC) 850/2004, and later by its recast EU POPs Regulation (EU) No 2019/1021 (as described below): Ban of the use of PFOS in various products, as well as provisions for wastes containing PFOS As of 2021 - Amendment of EU POPs Regulation (EU) No 2019/1021, regards the entry of PFOS: Ban of the use of PFOS in various products Regulation of waste disposal Product Regulations, Section 4-1 implementing the amendment to the EU POPs Regulation (EC) 850/2004, and later by its recast (EU) 2019/1021 2005 - Guidance on monitoring of leachate from landfills An action plan with focus on per- and polyfluorinated substances for the period 2016-2018. List of Priority Substances: Assessments, monitoring and screening
Oman	Production, use, import and export are prohibited as of 2009 (Ministerial Decision No. 25/2009). Restriction in accordance with Annex B (2004).
Pakistan	Restriction in accordance with Annex B (before 2001). Not renewed after 1992. Date of de-registration is June 1997. Prohibition on import (June 1992).
Panama	No legal or administrative measures in place.
Peru	No legal or administrative measures taken.

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
Poland	Restricted in accordance with Annex B. Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III (OJ L 223, 25.8.2010, p. 29).
Portugal	Prohibition on production, import and all uses (2010) Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants. If the quantity released into the environment is minimised, production and placing on the market is allowed for the following specific uses provided that Member States report to the Commission every four years on progress made to eliminate PFOS: (a) until 26 August 2015, wetting agents for use in controlled electroplating systems; (b) photoresists or anti reflective coatings for photolithography processes; (c) photographic coatings applied to films, papers, or printing plates; (d) mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems; (e) hydraulic fluids for aviation. Placing on the market and use of PFOS has been previously restricted in the Union by Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Prohibition on export (2008). No export ban but export is regulated since 2008 by the Regulations (EC) No 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous chemicals.
Qatar	Prohibition on import (2003).
Republic of Korea	Restricted in accordance with Annex B as of 2011. Refer to Persistent Pollutants Control Act (5 April 2011). See Stockholm Convention register of acceptable purposes for PFOS, its salts and PFOSF.
Republic of Moldova	Prohibition on production, import, export and uses (2016). Included in Waste Law 209/2016. Prohibited for production. The chemical has never been manufactured in the Republic of Moldova.
Romania	Restricted in accordance with Annex as of 2010.
Russian Federation	Currently under development.
Rwanda	Under development. Regulation to prohibit production, import, export and all uses in accordance with Annex B have not been yet gazetted (2018).
St. Kitts and Nevis	As of 2010, production of PFOS prohibited.
Saint Lucia	Legal or administrative measures under development. There is no overarching legislative framework for environmental or chemicals management; however, a draft Environmental Management Act (EMA) is currently being prepared that will support improved legal and administrative coordination of diverse sectoral initiatives necessary to support improved environmental management in Saint Lucia,
Samoa	Waste Management Act 2010 is the regulatory framework for Samoa to meet its obligations under the Stockholm Convention. Additional measures are needed to address PFOS specifically.
Sao Tome and Principe	No legal or administrative measures taken.
Serbia	As of 2012, restricted in accordance with Annex B.
Sierra Leone	No legal or administrative measures in place.
Singapore	As of 2008, restricted in accordance with Annex B; production is prohibited.
Slovakia	As of 2009, production, use, import and export are prohibited.
Slovenia	Restricted in accordance with Annex B (2009). Production, use, import and export prohibited. POPs are regulated through implementation of Regulation (EC) No 850/2004 of the European Parliament and of the Council on Persistent Organic Pollutants with its amendments as well additional national legislation.
Solomon Islands	No legal or administrative measures in place.
South Africa	No legal or administrative measures taken.
Spain	Restricted in accordance with Annex B. Production, use, and export prohibited (2010). EU regulation 757/2010 which amended Annexes I and III of Regulation (EC) 850/2004 on persistent organic pollutants established the following exemptions: The use of articles already in use in the Union before 25 August 2010 and containing PFOS as a constituent will be allowed. Production and sale are authorized for the following specific uses: • As photosensitive resins or antireflective coatings for photolithographic processes; • As coatings applied in photography to films, paper or plates for printing; • As mist suppressant for hardened non-decorative chromium plating (chrome VI) in closed-loop systems; • As hydraulic fluids for aviation.

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
	Exports are subject to the export notification procedure in accordance with Regulation 649/2012 of the European parliament and Council of 4 July 2012 on the export and import of dangerous chemical products.
Sri Lanka	Prohibition on all uses (2001}. Prohibition on production. No production and formulation in Sri Lanka.
State of Palestine	Restriction in accordance with Annex B; prohibition on production import export and all uses (2018).
Sudan	No legal or administrative measures taken.
Suriname	At present Suriname has no legislation that is specifically aimed at addressing POPs, except for the Pesticides Act. However, there are several laws and regulations that can be applied in the absence of specific POPs legislation. The use of sulfluramid is now prohibited.
Sweden	Restricted in accordance with Annex B (2010). Prohibition on production (2010), exports (2010) and uses (2008). The production, placing on the market and use of PFOS, its salts and other derivatives is regulated under the POP Regulation. No import to Sweden since 2019. The production, placing on the market and use of PFOS, its salts and other derivatives is regulated under the EU POP Regulation. Exemptions granted by the POP Regulation are significantly less than in the Stockholm Convention, as alternatives are available. The derogation is given for production and placing on the market for the following uses (a) until 26 August 2015, wetting agents for use in controlled electroplating systems; (b) photoresists or anti-reflective coatings for photolithography processes; (c) photographic coatings applied to films, papers, or printing plates; (d) mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems; (e) hydraulic fluids for aviation. There has been no manufacture in Sweden. The use of PFOS, its salts and other derivatives has been restricted in the EU since 2008 by Directive 2006/122/EC. These restrictions were later taken up in REACH Annex XVII by Regulation 552/2009. Some use within hard metal plating remains. One derogation remains for production and placing on the market for the use as mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems. In Sweden this use ended by 2020 according to national review.
Switzerland	Restriction in accordance with Annex B (2011); production prohibited (2011): (Ordinance on Risk Reduction Related to the Use of Certain Particularly Dangerous Substances, Preparations and Articles (Ordinance on Risk Reduction related to Chemical Products (ORRChem)) of 18 May 2005. It is prohibited to manufacture, place on the market or use PFOS, or any substance or preparation containing PFOS in a concentration equal to or greater than 0.001% by mass. It is prohibited to place on the market new articles, or parts thereof with a concentration of PFOS equal to or greater than 0.1% by mass calculated with reference to the mass of structurally or microstructurally distinct parts that contain PFOS; or with an amount of PFOS equal to or greater than 1 mg/m2 of coated material for textile or other material. Exempt from the prohibition are photoresists or anti-reflective coatings for photolithography processes; photographic coatings applied to films, papers, or printing plates; mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems where the amount of PFOS released into the environment is minimised; hydraulic fluids for aviation. It is prohibited to manufacture, place on the market or use PFOS, or any substance or preparation containing PFOS in a concentration equal to or greater than 0.001% by mass. Exempt from the prohibition is the manufacture of PFOS containing products for the allowed uses. Switzerland does not produce PFOS.
Tanzania	The current Environmental and Chemical legal instruments can partially address the requirements for sound management of PFOS, however new regulations under the same can be developed to adequately address the management and control of PFOS, including chemicals in articles and products.
Thailand	Restriction in accordance with Annex B (2017. Regulated under Hazardous Substance Act B.E. 2535 (1992). PFOS has to be registered and approval obtained from the Department of Industrial Works before production, use, importation and exportation can take place.
Trinidad and Tobago	Restriction in accordance with Annex B (2010). Production, export and uses are prohibited (2018). Use according to an exemption registered under the Stockholm Convention. There is no production in Trinidad and Tobago. Import Negative List (Legal Notice No 89 / Notice to Importers No. 1 of 1999)
Tunisia	No legal or administrative measures taken.
Türkiye	Restrictions in accordance with Annex B, under development: A by-law covering all POPs has been finalized and will be published by the end of 2018.
Tuvalu	No legal or administrative measures taken.
Ukraine	Restriction in accordance with Annex B (2007). Prohibition on production import export and all uses.
United Arab Emirates	Prohibition on production import export and all uses (2015). Ministerial Resolution No. 783 of 2015 Concerning Banned and Restricted Industrial Chemicals for Use in the country.
UK	Restricted in accordance with Annex B (2007).

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
Uruguay	No legal or administrative measures taken. To be addressed during the update of the national implementation plan.
Venezuela (Bolivarian Republic of)	Restriction in accordance with Annex B. 2001 De acuerdo al artículo 7 de la Ley sobre Sustancias, Materiales y Desechos Peligrosos Gaceta Oficial Extraordinaria Nº 5.554 de fecha 13 de noviembre de 2001... "Se prohíbe todos los usos, importación y distribución de los productos químicos contaminantes orgánicos persistentes a excepción del DDT, que podrá ser utilizado en forma restringida y sólo por los organismos oficiales, bajo la supervisión del Ministerio de Salud y Desarrollo Social, y con la aprabación del Ministerio del Ambiente y los Recursos Naturales, en caso de requerirse para el control de epidemias..."
Viet Nam	According to the Law on Environmental Protection 2020 and the Decree No. 08/2022/ND-CP dated 10 January 2022 of the Government guiding the implementation of the Law on Environmental Protection 2020 (hereinafter referred to as "Decree No. 08/2022/ND-CP"), the exemption register of PFOS in production has been regulated as follows: • Production: Specific exemption: None; Acceptable purpose: Intermediates for exemption register of Acceptable purpose; • Use: 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; Acceptable purpose: Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only.
Yemen	Production, import, export, and all uses are prohibited (Decision No. 86 (2018) of the Minister of Water and Environment on the list of industrial chemicals, pesticides, waste and hazardous wastes, that are banned, severely restricted and allowed in commerce in the Republic of Yemen).
Zimbabwe	Banned. Prohibition on import (2016)

6. Actions taken to phase out the use of PFOS, its salts and PFOSF

27. According to paragraph 4 of Part III of Annex B, each Party using these chemicals is encouraged to take action to phase out uses when suitable alternatives substances or methods are available.

28. Table 11 below provides a summary of available information on the actions taken to phase out the use of PFOS, its salts and PFOSF as well as alternative substances or methods introduced as provided by Parties and observers in their national reports and national implementation plans and the 2022 call for information.

29. Table 12 below provides the information on research and development of safe alternatives received from Parties in their national reports and through the 2022 call for information.

30. Three Parties provided information on alternatives (Canada, Republic of Korea and Sweden) through the 2022 call for information. Information was also received from observers. Viet Nam notes that some enterprises are using alternatives, however, it has yet to synthesise this information.

Table 11. Information on the actions taken to phase out the use of PFOS, its salts and PFOSF provided by Parties and observers (source: national reports, national implementation plans and 2022 call for information)

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
Metal plating (hard metal plating) only in closed-loop systems	Australia: Some users have switched to PFOS-free chemicals. Cameroon: Testing of products and articles that possibly containing PFOS at points of entry and the labelling of such products. Canada: Five-year time-limited exemptions were enacted under the Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations to allow industry sufficient time to transition to alternatives. One alternative substance that has been identified for use is "3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctane-1-sulphonate", (or 1H,1H,2H,2H- Perfluorooctanesulfonic Acid, CAS No. 27619-97-2), which is used at 1-5 wt% in FUMETROL 21. Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS No. 29420-49-3. Domestically this use has been prohibited since 2016 pursuant to the *Prohibition of Certain Toxic Substances Regulations, 2012*. Some short chain PFASs have been identified as alternative substances. This use was prohibited in Canada in 2008. In other parts of the world, 6:2 FTS is often used as a PFOS alternatives for mist suppression in metal plating (Kim et al., 2021). Czech Republic: ANKOR Dyne 30 MS Denmark: As of 2018, the use of PFOS for hard metal plating in closed-loop system has ceased in DK as PFOS has been replaced by another PFAS for this purpose. Finland: Trade name: Proquel Z/A Netherlands: PFOS probably phased out and replaced by alternatives. In quite a number of applications Cr6+ has or is in the process of being replaced by alternatives such as Cr3+. This process does not utilize PFOS. Norway: PFOS-free chemical alternative. Alternatives have been tested but have been found to be less efficient. The use of PFOS in this process is none the less very low. Republic of Korea: Korea registered this acceptable purpose on 15 May 2018 and will check alternatives and alternative technology. Alternative: 9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B (9Cl-PF3ONS)); CAS No. 73606-19-6; A type of mist suppressant in hard chromium plating Singapore: Use of chemical alternatives. Slovenia: No data on alternatives. Sweden: 6:2-Fluorotelomer sulfonate (6:2 FTS), CAS no 27619-97-2 is phased-in as mist suppressant in hard-metal plating with chromium (VI). The estimated annual consumption is estimated to be at least 100 kg per year calculated as the pure substance 6:2 FTS. It has been shown that 6:2 FTS is less stable than PFOS during the hard chrome plating process, which means that a much higher amount is needed of 6:2 FTS relative to PFOS to achieve the same protective effect in chromium baths in the hard chromium plating process. Non-chemical alternatives or processes Besides the use of 6:2 FTS, a physical alternative, PTFE (Polytetrafluoroethylene) coated balls has been tested with so far not proven promising results. Also, a PFAS free alternative hardening technique on steel instead of hard chrome plating with chromium (VI) has been reported to be in use. The technique is an induction process followed by hardening at about 1000°C followed by a tempering at 200°C to 400°C. Their hardening process ends with nitrocarburization at 500°C, which is a thermochemical surface treatment method that results in increased abrasion and corrosion resistance with satisfactory results close to what may be achieved with hard chrome plating with chromium (VI). UK: A number of companies have provided information on alternatives, these include: MACUPLEX STR NPFX mist controller/surface tension reducer supplied by MacDermid Enthone. The product is

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	described as a unique and complex mixture of anionic fluorinated surfactants. ANKOR Dyne 30 MS is a foamless, PFOS-free chrome mist suppressant. Produced by Enthone an Alent plc Company. Viet Nam: Now, there are some enterprises that are using a few alternatives in Viet Nam. However, Ministry of Natural Resources and Environment (MONRE) has not yet synthesized adequate information related to these alternatives.
Fire-fighting foam	Australia: Major users have switched to PFOS-free foams. Cameroon: Testing of products and articles that possibly containing PFOS at points of entry and the labelling of such products. Canada: Domestically this use has been prohibited since 2009 pursuant to the PFOS Regulations. Since 2016, under the *Prohibition of Certain Toxic Substances Regulations, 2012*, the remaining exemptions are for the use and import of AFFF that is present in a military vessel or military fire-fighting vehicle contaminated during a foreign military operation; and for the use of AFFF in which residual PFOS concentration is less than or equal to 10 ppm. AFFFs now contain fluorosurfactants based on short chain PFAS chemistry. Canada has proposed to prohibit these uses. Foams containing PFOS have not been manufactured in the U.S. or Europe since 2002. Substitutes to the use of PFOS in firefighting foams include C_6 fluorotelomers as well as fluorine-free solutions. The actual C_6 (or below) fluorosurfactants contained in AFFF formulations are considered proprietary by AFFF manufacturers. After 2000, significant developments were made to produce a new generation of firefighting foams that were fluorine-free. They contain water-soluble non-fluorinated polymer additives and increased levels of hydrocarbon detergents. Several types of fluorine-free foams are now available commercially in the marketplace (Sontake et al. 2014). Czech Republic: AFFF (STHAMEX®) FFFP (SCHAUMGEIST®) Finland: Fluorinated and fluorine-free alternatives are available. Madagascar: BIO fluoro Pro 6, PRFOLON 6, PROFILM6, Bio FLUOFOAM 6S, TUTOGENE A3F, PROFOAM, ANSULITE 3X3, UNISERAL AF 1612 SP3 AM Hungary: The implementation of Regulation 2019/1021/EU in Hungary is regulated by Regulation 376/2020. government decree. Based on the government decree, Hungary assessed the existing PFOS stocks, the disposal of which has begun. Luxembourg: Le Corps grand-ducal d'incendie et de secours (CGDIS) s'engage à être complètement sans PFAS/fluor jusqu'à fin 2023. Netherlands: PFOS is not used any more. Stocks removed in 2011. Legal measures to two companies that had PFOS containing FFF in 2012. Other fluorinated substances are used as well as non-fluorinated substances. Efficacy of alternatives for the various fires for which PFOS was used is still to be determined. Many regulators and authorities require tests or practice with fire-fighting foam installations. On an industrial scale, this requires huge amounts of foam to be spent and spilled into the environment. Not only PFOS-containing foams but also non-PFOS containing foams based on other fluoro compounds damage the environment. Various suppliers of fire-fighting foams advertise ‘practice’ or ‘test’ foams with environmentally less hazardous ingredients. The EU is currently in a process to greatly reduce the dependency on F-containing foams. New Zealand: PFOS was used in a number of applications, but the most dispersive use was in firefighting foams. The HSNO Act’s Fire Fighting Chemicals Group Standard 2006 prohibited all known PFOS-containing fire-fighting foams. In 2017, PFOS was found in soil and groundwater at some air force bases and airports, likely originating from the historic use of firefighting foams. In a small number of cases, legacy stocks of PFOS foams were identified as still being in use. A full inventory of PFOS firefighting foam stocks has yet to be completed. New Zealand is also undertaking research to identify the non-foam industries and activities in New Zealand that may have used PFOS. This research will assist regional councils with the identification of potentially PFOS-contaminated sites. (See also http://www.mfe.govt.nz/land/pfas-and-poly-fluoroalkyl-substances/pfospfoa-nz) Norway: Norway does not use PFOS-containing fire-fighting foams. A number of alternatives are available, both fluor-containing foam and foams without fluor. Due to trade secrets, we do not have information about the exact chemical composition of the foams. Republic of Korea: Korea registered this acceptable purpose on 15 May 2018 and will check alternatives and alternative technology. Romania: BIO HYDROPOL 6 containing 5-10% 2-(2-butoxyethoxy)ethanol (CAS No. 11234-5; EC 203-961-6) Physicochemical properties of 2-(2-butoxyethoxy)ethanol: • Vap.pres. = 0.02 hPa at 26.9ºC • Wat.sol.ct.= miscible at 20 ºC • logPow = 0.15-0.4 Quantities of use per year: 5729 kg BIO HYDROPOL 6 PROFOAM 806G containing 2-6% Hexylene glycol (CAS No. 107-41-5, EC 203489-0)

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	• hydrolyzed protein [70-80%], • metallic salt: NaCl+MgCl2 [8-15%]; FeSO4*7H2O[0-2%] Physicochemical properties of Hexylene glycol: • Vap.pres. = 0.07 hPa at 26.9ºC • Wat.sol.ct.= Miscible with water in all properties • logPow < 0.14 at 25 ºC Quantities of use per year: 15799 kg PROFOAM 806G Spain: Short chain fluorosurfactants, C6 fluorotelomer and dodecafluoro-2- metilpentan-3-ona. Fluoride-free fire-fighting foams (silicone based), hydrocarbon-based surfactants, synthetic detergent foams and protein foams. Sweden: Import of PFOS-containing fire-fighting foam ended in 2003. A survey of the chemical content of relevant FFFs on the market is ongoing. Switzerland: Partly fluorinated chemicals Thailand: Perfluorohexane sulfonic acid (PFHxS) UK: Telomer and fluorine-free alternatives Viet Nam: Now, there are some enterprises that are using a few alternatives in Viet Nam. However, Ministry of Natural Resources and Environment (MONRE) has not yet synthesized adequate information related to these alternatives. IPEN/ACAT: A range of fluorine-free as well as fluorinated alternatives exists for this use. See e.g.: The report from the European Commission (The use of PFAS and fluorine-free alternatives in fire-fighting foams);[25] the final report of the POP-Free project by the Research Institutes of Sweden (RISE);[26] and The IPEN report on fluorine free foam Fluorine-Free Firefighting Foams (3F): Viable Alternatives to Fluorinated Aqueous Film-Forming Foams.[27] La Grande Puissance de Dieu mentions two alternatives which according to the 2018 national implementation plan are used in Benin: Orcgidex AFFF 6% Eco (CAS No. 107-21-1) and Trimethyl-1-propanaminium iodide or [3-[[(heptadecafluorooctyl)sulphonyl]amino]propyl]trimethylammonium iodide (CAS No. 1652-63-7).
Insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp.	Brazil: There are no changes from the status informed at the last report submitted to COP-9 in 2019. Brazil supports the need for maintenance of the acceptable purpose of Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only. The Ministry of Agriculture in collaboration with some Universities has developed studies to test chemicals alternative, pursuant to the recommendations of the Review Committee on Persistent Organic Pollutants (POPRC) in its decision POPRC-8/8 and adopted by COP, which invited Parties that still use PFOS, its salts, PFOSF and its related chemicals for the control of leaf-cutting ants *Atta* spp. and *Acromyrmex* spp. to conduct studies, including pilot projects, to develop peer-reviewed information on the feasibility of using alternatives to PFOS, its salts, PFOSF and its related chemicals within an integrated pest management approach. There are basic studies being developed in research centres and universities evaluating biological products, such as entomopathogenic fungi, and natural products such as plant extracts for the control of leaf-cutting ants. The results, however, have been inconsistent, demonstrating technical infeasibility, economic and operational (Boarettto and Forti, 1997; Moreira et al.2004). Fenoxycarb, pyriproxyfen, diflubenzuron, teflubenzuron, silaneafone, thidiazuron, tefluron, prodrone, abamectin, methoprene, Hydramethylnon, boric acid, some insecticides from the group of neonicotinoids, pyrethroids, Spinosyns, etc., had been tested for leaf-cutting ants, but they were not effective. Guyana: Use of Fipronil and other pyrethroids as alternative. Trinidad and Tobago: Development of a citrus peel bait by a local company using Fipronil as the active ingredient. Trinidad and Tobago: Leaf cutting ant bait containing fipronil Viet Nam: Now, there are some enterprises that are using a few alternatives in Viet Nam. However, Ministry of Natural Resources and Environment (MONRE) has not yet synthesized adequate information related to these alternatives. ABRAISCA: According to the submission from Brazil peer-reviewed study “Review, analysis and discussion on the feasibility of the use of alternatives to PFOS, its salts, and PFOSF for the control of leaf-cutting ants *Atta* and *Acromyrmex* within the integrated pest management approach” set out in the document UNEP-POPS-POPRC11-FU-SUBM-PFOS-BRAZIL-3-20160108.En, there are no

[25] https://echa.europa.eu/documents/10162/28801697/pfas_flourine-free_alternatives_fire_fighting_en.pdf/d5b24e2a-d027-0168-cdd8-f723c675fa98).

[26] Promotion of PFAS-free alternatives https://www.ri.se/en/media/4957/download.

[27] https://ipen.org/documents/fluorine-free-firefighting-foams.

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	alternatives for replacement of sulfluramid to the control of leaf-cutting ants genus *Atta* spp. and *Acromyrmex* spp. taking into account technical feasibility, humans and environment effects, cost/effectiveness, availability and viability. IPEN/ACAT: One of the possible alternatives to the use of sulfluramid is applied biological control. A review covering a total of 691 experiments collected from 153 studies was recently published, that also evaluate the effectiveness as a function of their management efficacy, environmental and human health impacts, and their ease of application. It concluded that "chemical control methods were effective but posed a danger to human health and the environment, whereas mechanical methods and integrated management were more sustainable but not always very effective. Some of the biocontrol methods were evaluated as effective and safe for the environment and human health, including the use of entomopathogenic fungi *Beauveria bassiana* (Bals. -Criv) Vuill. (Hypocreales: Cordycipitaceae) and *Metarhizium anisopliae* (Metschn.) Sorokïn (Hypocreales: Clavicipitaceae) in the form of bait or sprayed in the nest, or the application of plant mulch in the nest using *Tithonia diversifolia* (Hemsley) A. Gray (Asterales: Asteraceae) or *Canavalia ensiformis* L. DC. (Fabales: Fabaceae)."[28]

Table 12. Information on research on and development of safe alternatives to PFOS, its salts and PFOSF as stipulated in paragraph 4 (c) of part III of Annex B to the Convention (source: national reports and 2022 call to information)

Party	Information on research on and development of safe alternatives
Australia	Research has been undertaken on PFOS alternatives, PFOS destruction technologies and remediation of contaminated sites.
Brazil	Ministry of Agriculture in collaboration with some Universities have developed studies to test chemicals alternative, pursuant to the recommendations of the Review Committee on Persistent Organic Pollutants (POPRC) in its decision POPRC 8/8 and adopted by CoP, which invited Parties that still use PFOS , its salts , PFOSF and its related chemicals for the control of leaf-cutting ants Atta spp. and Acromyrmex spp. to conduct studies, including pilot projects, to develop peer-reviewed information on the feasibility of using alternatives to PFOS, its salts, PFOSF and its related chemicals within an integrated pest management approach and present any findings to the Secretariat. Brazil presented a peer-reviewed study "Review, analysis and discussion on the feasibility of the use of alternatives to PFOS, its salts, and PFOSF for the control of leaf-cutting ants Atta and Acromyrmex within the integrated pest management approach" (UNEP-POPS-POPRC11-FU-SUBM-PFOS-BRAZIL-3-20160108). See references: Britto, J. S.; Forti, L. C.; Oliveira, M. A.; Zanetti, R.; Wilcken, C. F.; Zanuncio, J. C.; Loeck, A. E.; Caldato, N.; Nagamoto, N. S.; Lemes, P. G. And Camargo, R. S., 2016. Use of alternatives to PFOS, its salts and PFOSF for the control of leaf-cutting ants Atta and Acromyrmex, International Journal of Research in Environmental Studies (2016) 3(2).
Cameroon	Mise en place d'un mécanisme de collaboration avec les universités pour renforcer la recherche-développement dans le domaine des POPs à titre d'exemples le renforcement d'un laboratoire de recherche d'une université en matière d'analyse chromatographie en phase gazeuse.
Canada	Canada has provided extensive information for the work programme on the continued need for PFOS through each intersessional request. Canada has been an active contributor through several POPRC and COP intersessional work items and participated in the development of several document in relation to PFOS including the *Guidance on alternatives to perfluorooctane sulfonic acid and its salts, perfluorooctane sulfonyl fluoride and their related chemicals*. Canada is also part of the OECD/UNEP Global Perfluorinated Chemicals (PFC) Group, whose work supports a transition toward safer alternatives.[29]
China	Under the support of the National High-Tech Research Program (863 Program) in the field of resource and environmental technology, the project "Development Technology for PFOS and Its Salt Substitutes" was established, with a special fund of 4.2 million yuan.
Germany	1) Research report of the German Environment Agency on alternatives to PFOS in the metal plating industry (hard metal plating, decorative plating) https://www.umweltbundesamt.de/publikationen/use-of-pfos-in-chromium-plating-characterisation-of. 2) Report of the Environment Agency Germany on: Understanding the exposure pathways of per- and polyfluoralkyl substances (PFASs) via use of PFASs-containing products – risk estimation for man and environment https://www.umweltbundesamt.de/publikationen/understanding-the-exposure-pathways-of-per.

[28] Source: Control of Amazonian Leaf-Cutting Ants (Hymenoptera: Formicidae): A Multi-criteria Analysis Journal of Economic Entomology, 114(2), 2021, 493–504. doi: 10.1093/jee/toaa331.

[29] http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/alternatives/.

Party	Information on research on and development of safe alternatives
	3) Report of the Environment Agency on: Investigations on the presence and behavior of precursors to perfluoroalkyl substances in the environment as a preparation of regulatory measures https://www.umweltbundesamt.de/publikationen/investigations-on-the-presence-behavior-of 4) The Federal Environment Agency initiated, in the context of the "cleaner production Germany" project, a number of projects to support the substitution of PFOS in the metal plating industry. 5) Regarding the capacity building in emerging and developing countries for the introduction of alternatives of PFOS and its salts limited activities were initiated with German co-funding. The Stockholm-Secretariat has initiated a study on the environmental friendliness of PFOS substitutes for key applications in China. The mentioned study was prepared in cooperation with the Stockholm Regional Centre for Capacity-building and the Transfer of Technology in Asia and Pacific (SCRCAP), by the School of Environment, Tsinghua University together with national and international experts funded by Norway and BMUB. Also, under SCRCAP an exhaustive publication on “POPs in Articles and Phasing-Out Opportunities” has been prepared with BMUB / GIZ co-funding of technical expertise. 6) Innovative chrome electroplating of plastics for automotive components https://www.cleaner-production.de/index.php/en/topics/energy-and-material-efficiency/surface-engineering/galvanotechnics/6776-innovative-chrome-electroplating-of-plastics-for-automotive-components#summary.
Netherlands	Development of alternatives is stimulated through communication with stakeholders indicating the timeline of future prohibitions. For PFAS in general such a discussion is carried out currently.
Nigeria	Encouragement of Research and Development efforts in the formulation of safer alternatives in pest control. Integrated Pest Management (IPM) is also being promoted as against reliance on use of chemical-pesticides.
Norway	Norwegian authorities conduct regular monitoring activities and provide funding both nationally and internationally to support and encourage research and development in the field of persistent organic pollutants.
Republic of Korea	While PFOS sodium salt ($C_8F_{17}SO_3Na$) was not degraded by microorganisms for 28 days, the 4 alternatives were biodegraded at the rates of 21.6% for $C_{25}F_{17}H_{32}S_3O_{13}Na_3$, 20.5% for $C_{15}F_9H_{21}S_2O_8Na_2$, 15.8% for $C_{23}F_{18}H_{28}S_2O_8Na_2$ and 6.4% for $C_{17}F_9H_{25}S_2O_8Na_2$, respectively. The acute toxicity test using *Daphnia magna* was conducted for 48s hours, the half effective concentration (EC_{50}) of PFOS sodium salt was evaluated in 54.5 mg/L. While the 4 alternatives did not show any effect at 500.0 mg/L. The surface tension of the PFOS salt is 46.2 mN/m at a concentration of 500.0 mg/L. While the surface tension of the 4 alternatives was found to be superior to PFOS sodium salt. The four kinds of alternatives were found to be superior to PFOS sodium salt in terms of biodegradation, Daphnia sp. Acute toxicity and surface tension, and thus they were considered applicable as PFOS alternatives. Therefore, these alternatives are considered to be available as an alternative of PFOS (Choi et al., 2016).
Singapore	PFOS is controlled under the Environmental Protection and Management Act (EPMA) as Hazardous Substance which allowed the monitoring of the import, export and use of PFOS in Singapore. At the same time, we are working with industry to move towards the use of PFOS alternatives.
Sri Lanka	Considering the limitations in the country (Research, Human Resources and financial constraint) we will most preferably try to identify the alternatives and will make the necessary changes in the tax regime to promote alternatives and demote the use of products to the maximum possible levels.
Sweden	Through regulatory actions research and the development of alternatives by relevant industries. Besides the use of 6:2 FTS, one company is testing a physical alternative, namely PTFE (Polytetrafluoroethylene) coated balls. So far though only as pilot trials since this physical alternative have not yet proven promising results. Also, a PFAS free alternative hardening technique on steel instead of hard chrome plating with chromium (VI) has been reported to be in use. The technique is an induction process followed by hardening at about 1000°C followed by a tempering at 200°C to 400°C.
Thailand	Thailand is implementing of the GEF-6 funding Project entitled "Application of Industry-Urban Symbiosis and Green Chemistry to reduce releases of POPs and hazardous chemicals as well as GHG emissions, to support inclusive and sustainable growth.
Viet Nam	Not available.

6.1. Metal plating (hard metal plating) only in closed-loop systems

31. In many parts of the world 6:2 FTS or 6:2-fluorotelomer sulfonate (CAS No. 27619-97-2) is commonly used as a PFOS alternatives for mist suppression in metal plating (Kim et al., 2021). F-53B (9Cl-PF3ONS) or 9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (CAS No. 73606-19-6) is another mist suppressant used in hard chromium plating. Sweden has used 6:2 FTS since 2016. The estimated annual consumption is greater than 100 kg per year calculated as the pure substance. 6:2 FTS has been found to be less stable than PFOS during the hard chrome

plating process, which means that a much higher amount is needed relative to PFOS to achieve the same protective effect in chromium baths in the hard chromium plating process.

32. Sweden reports that one company is testing a physical alternative, polytetrafluoroethylene (PTFE) coated balls. However, so far the results are not promising. Another company uses a PFAS free alternative hardening technique on steel instead of hard chrome plating with chromium (VI). The technique is an induction process followed by hardening at about 1 000°C followed by a tempering at 200°C to 400°C. Their hardening process ends with nitrocarburization at 500°C. This is a thermochemical surface treatment method that results in increased abrasion and corrosion resistance with satisfactory results close to what may be achieved with hard chrome plating with chromium (VI).

6.2. Fire-fighting foam for liquid fuel vapour suppression and liquid fuel fires

33. Canada notes that foams containing PFOS have not been manufactured in the U.S. or Europe since 2002. Substitutes to the use of PFOS in fire-fighting foams include C_6 fluorotelomers as well as fluorine-free solutions. The actual C_6 (or below) fluorosurfactants contained in aqueous film forming foam (AFFF) formulations are considered proprietary by AFFF manufacturers. After 2000, significant developments were made to produce a new generation of firefighting foams that were fluorine-free. They contain water-soluble non-fluorinated polymer additives and increased levels of hydrocarbon detergents. Several types of fluorine-free foams are now available commercially in the marketplace (Sontake et al., 2014).

34. The observers, IPEN/ACAT, refer to various resources that identify fluorine-free as well as fluorinated alternatives alternatives to PFOS in fire-fighting foams:

(a) European Commission and European Chemicals Agency report *The use of PFAS and fluorine-free alternatives in fire-fighting foams* (Nicol et al., 2020);

(b) Research Institutes of Sweden (RISE) Promotion of PFAS-free alternatives (POPFREE, 2020); and

(c) IPEN report Fluorine free foam Fluorine-Free Firefighting Foams (3F): Viable Alternatives to Fluorinated Aqueous Film-Forming Foams (Allcorn et al., 2018).

6.3. Insect baits with sulfluramid

35. In its response to the 2022 call for information, Brazil notes that there are no changes in the status since the last evaluation and that it supports the need for maintenance of the acceptable purpose of Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from Atta spp. and Acromyrmex spp. for agricultural use only. An observer, ABRAISCA, refers to Brazil's previous submission "Review, analysis and discussion on the feasibility of the use of alternatives to PFOS, its salts, and PFOSF for the control of leaf-cutting ants Atta and Acromyrmex within the integrated pest management approach" which concluded that, taking into account technical feasibility, humans and environment effects, cost/effectiveness, availability and viability, there are no alternatives for replacement of sulfluramid to the control of leaf-cutting ants genus Atta spp. and Acromyrmex spp. In their fifth national report, Nicaragua reports that it uses granulated fipronil and/or sodium octaborate in baits for the control of red imported fire ants and termites and Trinidad and Tobago reports the use of fipronil as an alternative to sulfluramid.

36. IPEN/ACAT note that one of the possible alternatives to the use of sulfluramid is applied biological control. This is supported by the review of 691 experiments collected from 153 studies which Dionisi and colleagues (2021) evaluated biologival agents for effectiveness as a function of their management efficacy, environmental and human health impacts, and ease of application. This review concluded: "Chemical control methods were effective but posed a danger to human health and the environment, whereas mechanical methods and integrated management were more sustainable but not always very effective. Some of the biocontrol methods were evaluated as effective and safe for the environment and human health, including the use of entomopathogenic fungi *Beauveria bassiana* (Bals.-Criv) Vuill. (Hypocreales: Cordycipitaceae) and *Metarhizium anisopliae* (Metschn.) Sorokïn (Hypocreales: Clavicipitaceae) in the form of bait or sprayed in the nest, or the application of plant mulch in the nest using *Tithonia diversifolia* (Hemsley) A. Gray (Asterales: Asteraceae) or *Canavalia ensiformis* L. DC. (Fabales: Fabaceae). Because of variations in the efficacy data between laboratory and field tests, we are in favour of evaluating these control methods during field studies with different leaf-cutting ant species and under different environmental conditions."

6.4. Feasibility, efficacy and viability of the alternatives

37. In its response to the 2022 call for information, Sweden noted that when it came to the economic viability of the alternatives for hard metal plating, the degradation of 6:2 FTS, requires substantively higher amounts during the plating process relative to PFOS, to achieve the same protective effect in chromium baths in the hard chromium plating process. The costs therefore increase since the price of these products is or at least has been, similar. It further noted that since 2016 most chemical suppliers in Sweden only sell 6:2 FTS as mist suppressant for use in hard-metal plating with chromium (VI). They note that 6:2 FTS is a PFAS chemical, however.

38. In addition, Sweden indicated that there will be an increasing need to replace hard chrome plating with chromium (VI) with other processes where chromium (VI) is not used and that this would eliminate the need for PFAS. There are examples of alternative technologies, such as Ni-P and Ni-P composite coatings (with silica carbide (SiC) or wolfram carbide (WC) as reinforcing nanoparticles, that have demonstrated better wear and corrosion resistance than hard chrome plating. However, there are still no drop in alternatives available that are able to provide all the required properties for key parts in all sectors.

39. IPEN/ACAT indicated that alternatives for PFOS in fire-fighting foams are in use, economically viable and widely available.

40. For the use of baits with sulfluramid, in their submission IPEN/ACAT highlighted that sulfluramid is a significant source of PFOS contamination in Latin America. While no studies have quantified the cost of the environmental and human health impacts, they note that the continued use of sulfluramid is likely to have significant impacts, and remediation efforts are very costly. They indicated that alternatives should be evaluated in light of these broad financial impacts. IPEN/ACAT identified *Beauveria bassiana* and *Metarhizium anisopliae* as having been evaluated as being safe for the environment and human health, though only some strains have been approved by European regulations so far. ABRAISCA indicated that there are no alternatives for replacement of sulfluramid to the control of leaf-cutting ants genus *Atta* spp. and *Acromyrmex* spp. taking into account technical feasibility, humans and environment effects, cost/effectiveness, availability and viability.

41. ABRAISCA indicated that plants or plant extracts are often recommended to control leaf-cutting ants. Most research is restricted to laboratory studies and ineffective when carried out under field conditions (Britto et al., 2016). Control methods such as microbial control with Metarhizium anisopliae and Beauveria bassiana fungi, other biological control agents, use of plant extracts, mechanical and cultural methods, including the use of mulch with Tithonia diversifolia and Canavalia ensiformis, are in the research development stage and not available for use (BRITTO et al., 2016). Further information can be found in the literature review (Britto et al., 2016 and Dionsi et al., 2021).

7. Information on health and environmental effects of PFOS and alternatives

42. Three Parties (Canada, Republic of Korea, and Sweden) provided information on health and environmental effects including POPs characteristics and other hazards of PFOS, its salts, and PFOSF and their alternatives, as summarized in Table 13 below.

Table 13. Information on health and environmental effects including POPs characteristics and other hazards for PFOS and alternatives (source: 2022 call for information)

Party	Information on health and environmental effects including POPs characteristics and other hazards for PFOS and alternatives
Canada	The following studies pertain to health and environmental effects, including POPs characteristics and other hazards: Huang, J., Wang, Q., Liu, S., Lai, H., Tu, W. 2022. Comparative chronic toxicities of PFOS and its novel alternatives on the immune system associated with intestinal microbiota dysbiosis in adult zebrafish. *J. Haz. Mat*. 45. (DOI: 10.1016/j.jhazmat.2021.127950) MacInnis, J., De Silva, A.O., Lehnher, I., Muir, D.C.G., St. Pierre, K.A., St. Louis, V.L., Spencer, C. 2022. Investigation of perfluoroalkyl substances in proglacial rivers and permafrost seep in a high Arctic watershed. *Environ. Sci. Processes Impacts.* 24, 42-51. (DOI: 10.1039/D1EM00349F) Jouanneau, W., Léandri-Breton, D.-J., Corbeau, A., Herzke, D., Moe, B., Nikiforov, V.A., Gabrielsen, G.W., Chastel. 2022. A Bad Start in Life? Maternal Transfer of Legacy and Emerging Poly- and Perfluoroalkyl Substances to Eggs in an Arctic Seabird. *Environ. Sci. Technol.* (DOI: 10.1021/acs.est.1c03773) Kaboré, H.A., Goeury, K., Desrosiers, M., Duy, S.V., Liu, J., Cabana, G., Munoz, G., Sauvé, S. 2022. Novel and legacy per- and polyfluoroalkyl substances (PFAS) in freshwater sporting fish from background and firefighting foam impacted ecosystems in Eastern Canada. *Sci. Tot. Environ.* 816. (DOI: 10.1016/j.scitotenv.2021.151563) Barrett, H., Du, X., Houde, M., Lair, S., Verreault, J., Peng., H. 2021. Suspect and Nontarget Screening Revealed Class-Specific Temporal Trends (2000–2017) of Poly- and Perfluoroalkyl Substances in St. Lawrence Beluga Whales. *Environ. Sci. Technol.* 55(3) 1659-1671. (DOI: 10.1021/acs.est.0c05957) Spaan, K.M., van Noordenburg, C., Plassmann, M.M., Schultes, L., Shaw, S., Berger, M., Heide-Jørgensen, M.P., Rosing-Asvid, A., Granquist, S.M., Dietz, R., Sonne, C., Rigét, F., Roos, A., Benskin, J.P. 2020. Fluorine Mass Balance and Suspect Screening in Marine Mammals from the Northern Hemisphere. *Environ. Sci. Technol.* 54 (7), 4046-4058. (DOI: 10.1021/acs.est.9b06773)
Republic of Korea	***Long-range transport*** F-53B in whole eggs of black-tailed gulls from two islands in the Republic of Korea, Baengnyeongdo (BLD) and Hongdo (HD), were investigated during 2012–2018 (Wang et al, 2021). The concentration of F-53B in gull eggs presents a clear increasing tendency in both sites during 2012–2018. This increasing trend may suggest the use of F-53B, however, there is no information on F-53B usage in South Korea. ***Adverse effect*** Subchronic oral toxicity study was conducted for F-53B in Sprague Dawley (SD) rats. F-53B was administered orally once daily to male and female rats for 28 days at doses of 5, 20, and 100 mg/kg/day (Hong et al, 2020). There were no toxicologically significant changes in F-53B-treated rats, except in the thyroid gland. However, F-53B slightly reduced the serum concentrations of thyroid hormones, including triiodothyronine and thyroxine, compared with their concentrations in the vehicle group. F-53B also induced follicular hyperplasia and was associated with increased thyroid hormone biosynthesis-associated protein expression. These results demonstrate that F-53B is a strong regulator of thyroid hormones in SD rats as it disrupts thyroid function. ***Biota*** The concentrations of F-53B in whole eggs of black-tailed gulls from two South Korean islands, Baengnyeongdo (BLD) and Hongdo (HD), were investigated during 2012–2018 (Wang et al, 2021). F-53B were detected with a 100% detection frequency (DF) and its concentration was 1.92 ± 0.892 ng/g ww in BLD and 4.39 ± 2.15 ng/g ww in HD. ***Surface Water*** F-53B was analyzed in surface water samples collected from Han River in the Republic of Korea, in 2016 (Pan et al., 2018). F-53B was detected in all samples and the range of F-53B concentrations in 6 surface water samples were 0.02-0.06 ng/L. ***Sediment*** Concentrations of F-53B in sediment collected from 50 locations along the Korean coast in 2018 (Lee et al, 2020). F-53B showed a detection rate (DR, %) of 46% in sediment samples, and the concentration range was <0.002-0.013 ng/g dry weight.
Sweden	6:2 FTS is a PFAS. PFASs are a growing concern to our drinking water and food as they do not break down and are increasingly being accumulating in the environment and in living organisms, which ultimately can result in known and un-known toxic effects.

Party	Information on health and environmental effects including POPs characteristics and other hazards for PFOS and alternatives
Viet Nam	Viet Nam has participated with the regional countries to research, monitor and assess the POPs, including PFOS in the environmental components (wastewater, waste sludge, sediment) and articles, products and commodities containing PFOS as well as affect to human health. Some research as follows: Harada KH, Yang HR, Moon CS, Hung NN, Hitomi T, Inoue K, Niisoe T, Watanabe T, Kamiyama S, Takenaka K, Kim MY, Watanabe K, Takasuga T, Koizumi A. (2010). Levels of perfluorooctane sulfonate and perfluorooctanoic acid in female serum samples from Japan in 2008, Korea in 1994-2008 and Viet Nam in 2007-2008. Chemosphere. 79(3):314-9; Lin Tao, Jing Ma, Tatsuya Kunisue, E. Laurence Libelo, Shinsuke Tanabe, and Kurunthachalam Kannan., (2008). Perfluorinated compounds in human breast milk from several Asian countries, and in infant formula and dairy milk from the United States. Environ. Sci. Technol., 42 (22), 8597-8602; S. Fujii, N.P.H. Lien, H.T. Hai, S. Tanaka, K. Chinagarn, M. Nozoe, K. Kimura, W. Wirojanagud, A. Anton, J.Y. Hu, Y. Guan, T. Mizuno, K. Suwanna, Y.H. Liou., (2007). Perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) contamination of water environment in Asian countries. Annual Report of FY 2007, The Core University Program between Japan Society for the Promotion of Science (JSPS) and Viet Namese Academy of Science and Technology (VAST), 427–432; Joon-Woo Kim, Nguyen Minh Tue, Tomohiko Isobe, Kentaro Misaki, Shin Takahashi, Pham Hung Viet, Shinsuke Tanabe. (2013) Contamination by perfluorinated compounds in waternear waste recycling and disposal sites in Viet Nam. Environ Monit Assess 185:2909-2919; Tomohiko ISOBE, Joon-Woo KIM, Nguyen Minh TUE, Kentaro MISAKI, Shin TAKAHASHI, Pham Hung VIET and Shinsuke TANABE. (2012). Determination of Perfluoroalkyl Compounds in Aqueous Samples from Northern Viet Nam. Interdisciplinary Studies on Environmental Chemistry-Environmental Pollution and Ecotoxicology, Eds., M. Kawaguchi, K. Misaki, H. Sato, T. Yokokawa, T. Itai, T. M. Nguyen, J. Ono and S. Tanabe, pp. 239-244. © by TERRAPUB.

43. Sweden noted that over the past twenty years, per- and polyfluorinated substances (PFASs) has gained increased attention globally, as they have been demonstrated in relatively high levels in animals, such as polar bears. These substances are found in human blood, even in new-borns. There is research data that indicate that the longer the high-fluorinated carbon chain, the higher the toxicity and the greater the potential for bioaccumulation. Some PFASs degrade very slowly or not at all in nature, while others are transformed into extremely persistent substances. Many of them bioaccumulate, i.e. they accumulate in living organisms. Because PFASs are fat- and water-repellent, they are not stored in fatty tissue but they bind to proteins and are stored in other organs of the body, for example in the liver and blood. PFASs are a growing concern to Swedish drinking water and food as they do not break down and are increasingly being accumulating in the environment and in living organisms, which ultimately can result in known and unknown toxic effects.

7.1. Presence in humans

44. In a study of seven countries in Asia, Tao and colleagues (2008) measured PFC in breast milk PFOS was the most commonly detected compound. Median concentrations of PFOS varied significantly with the lowest concentration found in India (39.4 pg/mL), and the highest concentration in Japan (196 pg/mL). Overall, the concentrations measured were similar to or lower than the median, concentrations were reported from Sweden, the United States, and Germany (106−166 pg/mL). The average daily intake of PFOS by infants through breastfeeding was estimated to be 11.8 ± 10.6 ng/kg bw/day, which is 7−12 times higher than adult dietary intakes that have been reported in Germany, Canada, and Spain.

45. To assess the impact of the phase-out of PFOS and PFOA on human exposure, Harada and colleagues (2010) measured concentrations in serum samples from Japan (Sendai, Takayama and Osaka), Korea (Busan and Seoul) and Viet Nam (Hanoi). No uniform trend was found unlike the decrease observed in the US. This suggests that local factors related to production and use of these influence exposure.

7.2. Adverse effects

46. A sub-chronic oral toxicity study exposed Sprague Dawley (SD) rats to 5, 20, and 100 mg/kg/day 6:2 chlorinated polyfluorinated ether sulfonate (F-53B) for 28 days (Hong et al., 2020). The only toxicologically significant changes observed in treated rats was in the thyroid gland. Compared to the controls, F-53B slightly reduced the serum concentrations of thyroid hormones, including triiodothyronine and thyroxine. F-53B also induced follicular hyperplasia and was associated with increased thyroid hormone biosynthesis-associated protein expression. These results show that F-53B disrupts thyroid function in SD rats.

47. Zebra fish exposed to 1 μM of 6:2 chlorinated polyfluorinated ether sulfonate (F-53B), sodium *p*-perfluorous nonenoxybenzene sulfonate (OBS) and perfluorooctane sulfonate (PFOS) for 21 days showed that exposure to PFOS and its alternatives F-53B and OBS can induce hepatic immunotoxicity associated with intestinal microbiota dysbiosis (Huang et al., 2022) PFOS induced more severe oxidative stress in the liver than F-53B and OBS. The three substances induced similar anti-inflammatory effects, however. All three treatment groups showed disruption of the

intestine and significant correlation between the changed intestinal microbiota and liver and intestinal indicators. This suggests an interaction between the effects on the immune system and intestinal microbiota in zebra fish.

7.3. Presence in environmental media

48. A study of PFAS loading in Lake Hazen (Nunavut, Canada) estimated a total input of 2.04 kg PFAS, 78% (1.6 kg) coming from glacial rivers and 22% (0.44 kg) from snowmelt (MacInnis et al., 2022). The higher concentrations of PFAS concentrations in glacial rivers compared to those in surface waters of Lake Hazen suggest that melting glacial ice contribute to the presence of PFAS in the lake. The data also suggest that PFAS partition into vegetation and soil as river water flows downstream to the lake.

49. Pan and colleagues (2018) analysed several perfluoroalkyl ether carboxylic and sulfonic acids (PFECAs and PFESAs) in surface waters from China, the United States, the UK, Sweden, Germany, Netherlands, and the Republic of Korea. Hexafluoropropylene oxide dimer and trimer acids (HFPO-DA and HFPO-TA), chlorinated polyfluorinated ether sulfonic acid (6:2 Cl-PFESA) were detected frequently in all countries with median concentrations of 0.95, 0.21, and 0.31 ng/L, respectively. This suggests ubiquitous dispersal and distribution of these substances in global surface waters. While 6:2 hydrogen-substituted polyfluorooctane ether sulfonate (6:2 H-PFESA) was frequently detected in China (detection rate > 95%) but not found in any other country included in this study. The total riverine mass discharges of HFPO-DA, HFPO-TA, and ΣPFESAs for five of the major river systems in China were estimated at a peak of 2.6, 6.0, and 4.3 tons/year. The authors conclude that novel PFECAs and PFESAs could become global contaminants.

50. Pan and colleagues (2018) analysed F-53B in surface water samples collected from Han River in the Republic of Korea, in 2016. It was detected in all 6 samples with concentrations ranging from 0.02 to 0.06 ng/L. Concentrations of F-53B in sediment collected from 50 locations along the Korean coast in 2018 were also measured (Lee et al, 2020). F-53B was detected in 46% in sediment samples with a concentration range of <0.002 to 0.013 ng/g dry weight.

51. Kim and colleagues (2013) studies the occurrence of of 17 PFCs in ambient water in Viet Nam. Samples were collected from a municipal dumping site (MD), an a (BR) and a rural control site. The highest concentration (360 ng/L) was found in a leachate sample from a municipal dumping site. The mean concentration from an e-waste recycling site was 57 ng/L. The mean from the battery recycling site was 16 ng/L. By comparison, the mean concentration in the rural control site was 9.4 ng/L. This suggests that municipal solid waste and waste electrical and electronic equipment are potential contamination sources of PFCs in Viet Nam. Perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), and perfluoroundecanoic acid (PFUDA were the most abundant with their respective concentrations measured at <1.4–100, <1.2–100, and <0.5–20 ng/L.

7.4. Presence in biota

52. Spatiotemporal trends of PFAS and their alternatives in black-tailed gull eggs were investigated in two islands of the Republic of Korea, Baengnyeongdo (BLD) and Hongdo (HD), over the period 2012 to 2018 (Wang et al, 202). Of the compounds analysed, 16 were detected at concentrations of 21.3–47.8 ng/g ww in BLD and 11.2–40.0 ng/g ww in HD. The study found increasing concentrations of PFNA, PFOS and F-53B in the gull eggs over the period studied. F-53B was detected in 100% of the samples with concentrations of 1.92 ± 0.892 ng/g w.w. in BLD and 4.39 ± 2.15 ng/g w.w. in HD. Available data suggest that F-53B is being used in the Republic of Korea, although there is no information available on such use.

53. A study that looked at legacy and emerging PFAS in birds (Jouanneau et al 2022) reported a linear association between females and eggs for most of the PFAS compounds analysed, though it did not detect emerging PFAS compounds in female plasma. The maternal transfer ratios in females and eggs suggest that the longest chain perfluoroalkyl carboxylic acids (PFCAs) are preferentially transferred to the eggs. Linear PFOS was the most commonly identified compound followed by perfluoroundecanoic acid (PFUnA) or perfluorotridecanoic acid (PFTriA); 84% of egg yolks were contaminated with 7:3 fluorotelomer carboxylic acid. The study also identified presence of ADONA in wildlife.

54. A study compare the presence of PFAS in wild sporting fish from boreal freshwater ecosystems in eastern Canada (background sites, 2013–2014 summer seasons), to fish impacted by a major AFFF release (summer 2013 and autumn 2014) (Kaboré et al., 2022). A total of 74 fish of different species were collected from 13 ecosystems. Of 29 quantitative PFAS, 15 were detected in fish from background sites including perfluorocarboxylates ($C_{6,8–14}$), perfluoroalkane sulfonates ($C_{6,8,10}$), perfluorooctane sulfonamide (FOSA), 6:2 fluorotelomer sulfonate (6:2 FTSA), 7:3 fluorotelomer carboxylic acid (7:3 FTCA), and a zwitterionic PFAS–perfluorooctane sulfonamidoalkyl betaine (PFOSB). The following subtsances were prevalent in the AFFF-impacted site: Long-chain fluorotelomer sulfonamidoalkyl betaines (e.g., 8:2 and 10:2 FTAB), fluorotelomer betaines (e.g., 9:3 and 9:1:2 FTB), and fluorotelomer sulfone propanoic acids (e.g., 8:2 FT(SO_2)-PA, 10:2 FT(SO_2)-PA)). The PFOS concentrations found were below existing recommended tolerable daily intake for human fish consumption.

55. Livers of the beluga whales (*Delphinapterus leucas*) from the St. Lawrence Estuary in Canada collected from 2000 to 2017 (Barrett et al., 2021) The presence of a suite of 54 legacy and unregulated PFAS grouped into nine structurally distinct classes were investigated. Most PFAS were found in higher concentrations in newborn and young whales than in adults. This suggests that PFAS exposure occurs through the placenta and lactation. Between 2000 and 2017, concentrations of legacy per- and polyfluoroalkyl acids and perfluorooctane sulfonamide decreased significantly in beluga whale liver. In contrast, the concentrations of the unregulated short-chain PFAS alternatives, H-PFCAs, and odd-chain FTCAs were found to increase over this period.

56. Spaan and colleagues (2020) combined suspect screening with organofluorine mass balance to assess PFAS exposure in 11 different marine mammal species across the northern hemisphere. Screening identified an additional 37 PFAS (not included in the targeted analysis) bringing the total to 63 detected PFASs from 12 different classes. Twenty of the 36 PFAS analysed were quantifiable in one or more samples, with the highest sum PFAS concentrations (Σ36 PFAS 3600−4000 ng/g) observed in polar bears. These were an order of magnitude higher than found in most other marine mammals. The highest concentrations in cetacean liver samples were found in killer whales from East Greenland (Σ36 PFAS 614 ± 49 ng/g, w.w.). In seals, the highest concentrations were detected in harbor seals (Σ36PFAS 640 ± 51 ng/g, w.w.) and ringed seals (Σ36PFAS 536 ± 43 ng/g, w.w.) from Sweden. Σ36 PFAS levels were lower in seals from Iceland, with concentrations of 23 ng/g in grey seal, 43 ng/g in harp seal, and 67 ng/g harbor seal. The three most predominant compounds in polar bears were PFOS (45−51% of Σ36 PFAS), 7:3 FTCA (23−28%), and PFNA (9−13%). PFOS dominated the Σ36PFAS fraction in samples cetaceans in most locations, except for samples from the US Atlantic coast, where 7:3 FTCA was dominant: up to 64% of Σ36 PFAS in harbor seal up to 71% in harbor porpoise. The authors concluded that the results highlight the importance of a multiplatform approach for accurately characterizing PFAS exposure in marine mammals.

8. Progress made to eliminate PFOS, its salts and PFOSF and the continued need for the specific exemptions and/or acceptable purposes

57. According to paragraph 3 of Part III of Annex B, each Party that uses and/or produces PFOS, its salts and PFOSF shall report on progress made to eliminate PFOS, its salts and PFOSF.

58. Table 14 below provides a summary of latest available information on the progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes provided by Parties in their national reports, national implementation plans and responses to the calls for information in 2018 and 2022.

Table 14. Information on progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes provided by Parties (source: national reports, national implementation plans and responses to the call for information in 2018 and 2022)

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
Argentina	Argentina no ha ratificado la enmienda correspondiente a PFOS, sus sales y PFOSF, por ese motivo, aún no se ha notificado las exenciones y usos aceptables que podría necesitar el país. Sin embargo, se han realizado esfuerzos para reducir y restringir el uso de estas sustancias, incluida la sulfluramida, de acuerdo a las previsiones del Convenio.
Austria	All PFOS uses have ceased in Austria. As an Austrian contribution and data basis for the revision of the EU Best Available Technique Reference Document (BREF) "Surface treatment of metals and plastics", a report was drawn up that describes the state of the art in the Austrian surface treatment of metals industry. BREFs are created on the basis of the Industrial Emissions Directive (IED; Directive 2010/75/EU) in the so- called Sevilla-process and define best available techniques and the emissions associated with their use. At the end of the EU BREF revision process, a chapter of the revised BREF, the so-called BAT conclusions, will be published in the Official Journal as an EC implementation decision. No later than four years after publication, the state of the art specified in the BAT conclusions must be observed by such industrial installations that are covered by the respective BAT conclusions. In Austria, the specifications relevant to wastewater are implemented nationally in general binding rules, in this case in the Waste Water Emissions Ordinance on Surface Treatment. For PFOS if the quantity released into the environment is minimised, manufacturing and placing on the market is allowed for the following specific uses provided that Member States report to the Commission every four years on progress made to eliminate PFOS: mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems. Where such a derogation concerns production or use in an installation within the scope of Directive 2008/1/EC of the European Parliament and of the Council (4), the relevant best available techniques for the prevention and minimisation of emissions of PFOS described in the information published by the Commission pursuant to Article 17(2), second subparagraph of Directive 2008/1/EC shall apply. As soon as new information on details of uses and safer alternative substances or technologies becomes available, the Commission shall review the derogation in the second subparagraph so that: (a) the uses of PFOS will be phased out as soon as the use of safer alternatives is technically and economically feasible; (b) a derogation can only be continued for essential uses for which safer alternatives do not exist and where the efforts undertaken to find safer alternatives have been reported on; (c) releases of PFOS into the environment have been minimised by applying best available techniques.
Belize	Sulfluramid is an extensively used POPs pesticide in Belize. It is recommended that a thorough assessment of alternatives to sulfluramid is done to determine the needs for exemptions. This is especially true of sulfluramid due to its extensive use and possible alternatives for use in Belize such as chlorpyrifos and fipronil (phenylpyrazole).
Belgium	Belgium reports that the country’s specific exemption (hard metal plating and decorative plating) does not need to be extended after 2015
Benin	The 2018 national implementation plan indicates no data are available to ascertain if such uses are occurring.
Brazil	Brazil supports the need for maintenance of the acceptable purpose of Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only (SC-9/4: Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride) as in Annex B of the Stockholm Convention text. Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. for agricultural use only: The insect baits with sulfluramid for control of leaf-cutting ants is indispensable for the Brazilian Agriculture. According to peer-reviewed study “Review, analysis and discussion on the feasibility of the use of alternatives to PFOS, its salts, and PFOSF for the control of leaf-cutting ants Atta and Acromyrmex within the integrated pest management approach ” the chemical control with toxic baits is still the only one that has technology available to control leaf-cutting ants genus *Atta* spp. and *Acromyrmex* spp. with technical, economic and operational viability and that sulfluramid is among the active ingredients currently registered in Brazil, the only one who has all the characteristics necessary to proper functioning of a toxic bait, which places it as the only effective option to control leaf-cutting ants.

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
	The leaf-cutting ants of the genus *Atta* spp. and *Acromyrmex* spp. are among the most important plagues of the Brazilian agriculture, because their voracious attacks occur throughout the year and are spread to the entire country. The damages are immense, bringing losses to large and small crops, fruit and vegetable cultures, pastures, reforesting, etc. Sulfluramid is, among the active ingredients, the best one with all features necessary for the good operation as an ant bait, which places it as the single efficient option to control leaf-cutting ants, taking into account technical feasibility, humans and environment effects, cost/effectiveness, availability and viability. Currently, the active ingredients registered in Brazil for ant baits are sulfluramid, fipronil and chlorpyrifos. Chorpyrifos as insect baits is no longer used in Brazil for control leaf cutting ants. According to the Brazilian Annex F information, sulfluramid cannot currently be efficiently replaced in Brazil by any other registered products commercialized since these alternatives have been questioned concerning their efficiency. Research is being conducted to identify alternatives, but at the moment sulfluramid cannot be replaced in Brazil.[30] Brazil concludes that among available the active ingredients, taking into account technical feasibility, humans and environment effects, cost/effectiveness, availability and viability, sulfluramid is the most efficient option to control leaf-cutting ants. Therefore, there is a need to maintain Insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. as an acceptable purpose.
Bulgaria	No use of PFOS in articles is identified, thus no need for specific exemptions and acceptable purposes are needed by Bulgaria.
Cambodia	Cambodia notified the Secretariat that it plans to continue to permit the use of existing stock of fire-fighting foam containing PFOS in an emergency only. Imports of new fire-fighting foams containing PFOS will be prohibited.
Canada	Canada no longer requires specific exemptions for photo masks in the semiconductor and liquid crystal display (LCD) industries, metal plating (hard metal plating) and metal plating (decorative plating) as they are now prohibited. Additionally, based on consultations with stakeholders regarding current activities, Canada no longer requires the acceptable purposes photo imaging, photo resist and anti-reflective coatings for semi-conductors, etching agent for compound semi-conductors and ceramic filters, aviation hydraulic fluids, and metal plating (hard metal plating) only in closed-loop systems. Firefighting foams. The Regulations that prohibit the manufacture, use, sale, offer for sale and import of these substances are currently being updated. The proposed changes would align with the Stockholm Convention's 2019 amendments to the listing. For further details, please see proposed amendments: https://gazette.gc.ca/rp-pr/p1/2022/2022-05-14/html/reg2-eng.html. Canada is not currently registered for any acceptable purpose or specific exemptions. Since 2008, PFOS, its salts and compounds that contain one of the following groups: $C_8F_{17}SO_2$, $C_8F_{17}SO_3$ or $C_8F_{17}SO_2N$ (collectively referred to as PFOS) has been restricted in Canada through the *Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations* (PFOS Regulations), with a limited number of exemptions. In 2016, PFOS was added to the *Prohibition of Certain Toxic Substances Regulations, 2012*, which currently prohibits the manufacture, use, sale, offer for sale and import of PFOS, and products containing PFOS, with a limited number of exemptions. As a result, the PFOS Regulations were repealed. Proposed amendments to the *Prohibition of Certain Toxic Substances Regulations, 2012*, are expected to remove remaining exemptions, aligning with the PFOS listing under the Stockholm Convention. The proposed regulatory approach is to remove the exemptions that allow the manufacture, use, sale, offer for sale and import of PFOS, or a product containing it, that is designed for use in photoresists or anti-reflective coatings for photolithography, or for use in photographic films, papers and printing plates. The exemption allowing the use of PFOS present in a military vessel or military fire-fighting vehicle contaminated during a foreign military operation would also be removed.
China	The Ministry of Ecology and Environment has invited the ministries and units such as the Ministry of Agriculture and Rural Affairs, the Ministry of Industry and Information Technology, the Emergency Management Department, China National Petroleum Corporation and China National Offshore Oil Corporation to discuss the need for continued use of PFOS and its salts. Specific exempted uses and acceptable uses for these substances including and perfluorooctane sulfonyl fluoride were reviewed.
Colombia	Two actions that will make it possible to obtain information on this type of substances: • Prepare and keep updated the national inventory of POPs for industrial use; and • Detail the tariff sub-items to the level required to carry out inventories and studies on POPs for industrial use.
Czech Republic	Review is carried out regularly at the national and EU level. As of the beginning of 2018 the Czech Republic no longer needs the following registered purposed: Photo-imaging, Photo-resist and anti-reflective coatings for semi-conductors and Aviation hydraulic fluids. The Czech Republic will withdraw these uses from the

[30] http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/alternatives/.

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
	register in 2019 once these changes are reflected in EU legislation. More time needed to introduce PFOS-free technologies in Metal plating (hard metal plating) only in closed-loop systems.
Denmark	Denmark has no further need for the notified specific exemption for metal plating (hard metal plating and decorative metal plating) after the specific exemption period expires in 2014 as metal plating in Denmark is performed in closed-loop systems. Denmark has used PFOS for the acceptable purpose metal plating (hard metal plating) only in closed-loop systems. The other acceptable purposes are not performed in Denmark. As of 2018, the use of PFOS for hard metal plating in closed-loop system has ceased in Denmark as PFOS has been replaced by another PFAS for this purpose.
European Union	As feasible alternatives exist, the European Union had determined that the acceptable purpose for photo resist and anti-reflective coatings for semi-conductors is no longer required for members of the European Union or the European Economic Area. At least five Member States in EU/EEA have declared continuous need for Metal plating (hard metal plating) only in closed-loop systems as an acceptable purpose, namely: Denmark, Finland, Norway, Sweden, Belgium and Slovenia. The EU has withdrawn its notification for the production and use of aviation hydraulic fluids on 09/06/2017, the withdrawal of the notifications for use of PFOS as etching agent for compound semi-conductors and ceramic filters as well as in photo-imaging was announced to follow soon.
Finland	Finland notes the European Union wide review carried out in 2014 to determine whether specific exemptions were still needed and indicates that the acceptable purposes continue to be needed.
France	France reports the ongoing review at the European level.
Germany	None of the acceptable purposes for PFOS are needed in Germany. The acceptable purposes for PFOS in the EU will prevail.
Hungary	On 09/06/2017 The European Union informed the Secretariat that the production and use of PFOS for the acceptable purpose "aviation hydraulic fluids" is no longer required. Consequently, the notification of the production and use of PFOS for the acceptable purpose "aviation hydraulic fluids" was withdrawn from the registry.
Ireland	Ireland has reviewed the continued need for an 'acceptable purpose' for 'Photo-resist and anti-reflective coatings for semi-conductors' in accordance with EU POPs Regulation 850/2004.
Japan	The acceptable purposes were withdrawn in 2018.
Monaco	Not applicable in Monaco.
Myanmar	Myanmar uses Tributyl Phosphate (SKYDROL LD-4/500B-4) as a hydraulic fluid.
Netherlands	Report (Dijkers 2016) submitted to the Stockholm Secretariat Spring 2014 and entitled "Inventory on the use of PFOS in the Netherlands" and the report "PFOS in the Dutch finishing industry - final02072014.doc", which describes the meeting between the Dutch CA and the chromium plating branch organisation. More recently an overview was made by the European Union. Hauzenberger et al 2016 Assessment of the continued need for PFOS, Salts of PFOS and PFOSF (acceptable purposes and specific exemptions) Final Report November 2016. UNEP-POPS-POPRC13FU-SUBM-PFOS-EU-20180216.En. The Inventory on the use of PFOS in the Netherlands (RHDHV, 2013) concludes that the specific exemptions for the application of PFOS in aviation hydraulic fluids and in photo-imaging are no longer necessary in the country.
New Zealand	New Zealand has not registered for specific exemptions nor acceptable purposes. All PFOS uses are prohibited in New Zealand, since 2011, under Schedule 2A of the Hazardous Substances and New Organisms Act 1996 (HSNO Act) which implements the Stockholm Convention.
Norway	As for the acceptable purposes metal plating (hard metal plating) only in closed-loop systems the current use of PFOS in this application has been low and does now seem to be phased out.
Poland	The review of the continued need for those purposes is sustained and takes place on EU level. Poland has not registered individually for acceptable purposes. However, EU has registered for acceptable purpose related to production and use: • Photo-imaging; • Photo-resist and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Aviation hydraulic fluids (withdrawn on 09/06/2017); • Metal plating (hard metal plating) only in closed-loop systems. The EU restriction is not limited to PFOS, its salts and PFOSF but covers all PFOS derivatives defined as $C_8F_{17}SO_2X$ where X= OH, metal salt (O-M+), halide, amide, and other derivatives including polymers. The fire-fighting foams that were placed on the EU market before 27 December 2006 could be used till 27 June 2011.

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
Republic of Korea	No information available on progress made. A study was performed to investigate the degradation efficiency of PFOS by electron beam, to evaluate the predicted toxicity of the radiolysis products using the ECOSAR model, and to identify the radiolytic products of PFOS. Aqueous PFOS was decomposed by increasing the absorbed dose. In addition, in this study decomposition products of PFOS treated by electron beam were identified twelve intermediates, and ten radiolytic products were confirmed with authentic standards, while two were proposed via interpretation of MS^2 fragments. Various electron beam-induced decomposition products formed based on bond cleavage and combined mechanisms of cleavage and transformation. In particular, seven short-chain PFCA radiolytic products were formed due to repeated CF_2 cleavage after dissociation of the tail group of SO_3. As a result of using the ECOSAR model, the toxicity levels of by-products after electron beam treatment were reduced by decreasing the carbon-chain number of PFOS. Reduction of the length of the carbon chain and elimination of the head group by the electron beam were important causes of decreased toxicity (Kim et al., 2018).
Romania	The review for the continued need for the specific exemption(s) and/or acceptable purpose(s) was carried out in Romania during March until August 2014. According to the information provided by the National Environment Protection Agency, over the Romanian territory there are no economic operators that produce or use PFOS, its salts and PFOSF.
Saint Lucia	PFOS containing fire-fighting foams in use and continued use required until suitable and affordable alternative can be sourced.
Sierra Leone	An activity is included in the 2019 national implementation plan update to establish an appropriate systematic methodology of an exemption is needed to appropriately meet the obligations under Article 4 in future.
Spain	The use of PFOS is residual in Spain in the metal plating sector (hard metal plating and decorative plating), therefore there is no need to renew these specific exemptions. Communication has been initiated with the industry regarding the use in aviation hydraulic fluids and photographic and photolithographic processes but there were no sufficient answers to draw conclusions
Sudan	The review on the continued need for the specific exemption(s) and/or acceptable purpose(s) is currently carried out under the NIP update process. Based on the findings Sudan will submit/not submit a notification to the Basel, Rotterdam and Stockholm Secretariat.
Suriname	An activity is included in the 2019 national implementation plan update to establish an appropriate systematic methodology if an exemption is needed to appropriately meet the obligations under Article 4 in future.
Sweden	In 2020 a national review was made on the use of PFOS as mist suppressant in hard metal plating and its alternatives. Sweden has since 2019 no import of PFOS for this use and since 2016 6:2 FTS has been phased in for use mist suppressant in hard metal plating using chromium VI.
Switzerland	The specific exemptions for Metal plating (hard metal plating) and Metal plating (decorative plating) are no longer needed.
Tanzania	The 2018 national implementation plan states that Tanzania will submit the following requests to the Secretariat of the Convention for entry into the Registers: (a) Fire-fighting foams, because even though fire-fighting foams which contain PFOS are not produced in Tanzania, the preliminary inventory has shown that there are still fire-fighting foams which may contain PFOS in usage and in supplies; (b) Consumer products such as textiles, including carpets, upholstery, paper and packaging, coatings, and industrial and household cleaning products which may contain PFOS and its related components, which were imported and are still being imported into Tanzania;
Thailand	Thailand has already classified PFOS, its salts and PFOSF as Hazardous Substance under the Hazardous Substances Act 1992 in order to control and track in all activities, including production, import, export and possession. The production, importation, exportation and having in possession have to be registered and approved by Department of Industrial Works, Ministry of industry. At present, there is no registration of the production, importation, exportation of PFOS, its salts and PFOSF by any entrepreneurs yet.
Tuvalu	The 2019 national implementation plan notes that as a country that does not produce chemicals, Tuvalu does not have any plans to import any of these chemicals for use or release in the country and as such, no exemptions are required.
UK	The UK government reviewed the need for the continued use of the specific exemption for metal plating in early 2014 and confirmed to the European Commission (EC) that this was no longer needed. The EC communicated this to the Secretariat of the Stockholm Convention on 25/06/14. In August 2022 review of the exempted uses for PFOS, the UK received no notification that exemptions and derogations for PFOS were still being used. The UK government has undertaken the following outreach to promote the elimination of PFOS, its salts and PFOSF: **Communications** The Environment Agency, the regulator in England, encouraged Fire and Rescue Services to move away from PFOS-containing foams, before it became a legal requirement. This was done via guidance in a

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
	Communities and Local Government Circular released in July 2006 (Ref 40/2006). However, there had been no further communication on the subject and no co-ordinated communications to those industry sectors whose operators could hold their own foam stocks for use in case of fire incidents. **Briefings** A briefing note about the required phase-out and necessary actions was circulated: • Sent directly to permitted sites via their Environment Agency inspector; • Uploaded to the Communities of Practice forum for Pollution Prevention Control staff at local authorities; • Shared with Health Safety Executive's (HSE's) COMAH (Control of Major Accident Hazards) business support unit; • Emailed to a number of relevant trade associations for onward cascade to their members; • Sent for inclusion in the Energy Institute's revised Code of Practice; • Uploaded to the PFOS webpage on the Environment Agency's external website; • Other external communications. Three articles were published in relevant trade journals: • Article and later update published in JOIFF's month publication–The Catalyst magazine (January 2011, follow-up in July 2011); • Feature article (interview) published in the Industrial Fire Journal (IFJ Q3, 2011); • A presentation was also delivered to the Humber Chemical Forum (Fire and Security Group) meeting. **Outcomes** There is no direct requirement to notify the Environment Agency when PFOS foams are being disposed of; however, the campaign has led to disposal information being submitted to the CCT via enquiries. To date, approximately 27,000 litres of PFOS contaminated material (foams and contaminated system wash water) has been sent for disposal by hazardous waste incineration.
Viet Nam	After assessing and summing up the continued need for the acceptable purpose and specific exemption register for PFOS, Viet Nam will submit the notification of exemption register for PFOS to the Secretariat.

9. Capacities for countries to transfer to reliance on alternatives to PFOS, its salts and PFOSF

59. One source of information listed in paragraph 5 of Part III of Annex B to the Convention to be used by the Conference of the Parties as the basis for the evaluation of the continued need for PFOS, its salts and PFOSF is information on progress in building the capacity of countries to transfer safely to reliance on alternatives. This information was collected thorough the call for information in 2022. Article 15 national reports contain a question related to the promotion of research and development of safer alternatives.

60. In its response to the 2022 call for information, Canada notes that it has been an active contributor through several POPRC and COP intersessional work items and has participated in the development of several documents in relation to PFOS, including the 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. Canada has an expert on the best available techniques and best environmental practices (BAT/BEP) committee. This expert group recently developed guidance on BAT/BEP for the use of PFOS and related chemicals listed under the Stockholm Convention. Canada is also part of the OECD/UNEP Global Perfluorinated Chemicals (PFC) Group, whose work supports a transition toward safer alternatives.[31] In their national reports Parties also mention that they exchange information through the Secretariat and refer to funding provided to the GEF or bilateral project initiatives.

61. Several Parties mention efforts to develop alternatives, most of these initiatives being within industry. Some Parties indicate participation in testing alternatives identified elsewhere to ensure their suitability in the local context. Efforts are underway to assess alternatives to the use of sulfluramid for the control of leaf-cutting ants in Brazil and other countries of the region.

62. Activities pertaining to the safe transition to alternatives to PFOS, its salts and PFOSF may be further considered in the development of the action plans for reducing and ultimately eliminating the production and/or use of PFOS, its salts and PFOSF in accordance with paragraph 4 (b) of Part III of Annex B, further to the completion and adoption of updated NIPs.

63. Many Parties indicated in their national reports the unavailability of information on alternative substances or methods, the lack of financial resources and insufficient technical capacity as challenges hindering their taking actions to phase out the use of PFOS, its salts and PFOSF and transfer to safer alternative substances or methods. A number of developing country Parties reported inability to take action on the implementation of alternatives to PFOS, its salts and PFOSF and to transfer safely to reliance on alternatives to PFOS, its salts and PFOSF in lack of above-mentioned means.

[31] http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/alternatives/.

10. Sulfluramid

10.1. Background

64. Sulfluramid has been used as an active ingredient in ant baits to control leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. and for control of red imported fire ants, and termites. PFOSF is used as an intermediate in the production of sulfluramid for the production of insect baits. In addition, given that sulfluramid may degrade to PFOS, its use could represent a direct release of PFOS to the environment.[32]

65. The Secretariat has received notifications for acceptable purposes from Brazil for production and use of PFOS for insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. According to the information provided by Parties in national reports, national implementation plans and responses to the calls for information in 2018 and 2022, other countries may still be using sulfluramid: Argentina, Benin, Belize, Brazil, Colombia, Costa Rica, Guatemala, Honduras, Mexico, Panama, Paraguay, and Trinidad and Tobago. Brazil has also noted exports of sulfluramid to the following countries in 2017: Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and Paraguay. Brazil had also exported to Peru, Suriname, and Uruguay in the past. Saint Lucia and Suriname note that use of sulfluramid is no longer permitted in their country.

66. In 2016, the Committee developed the consolidated guidance on alternatives to PFOS and its related chemicals.[33] It noted that the following alternatives, chlorpyrifos, cypermethrin, fipronil, abamectin, deltamethrin and fenitrothion were available as commercial products on the Argentinian market. It also noted that the active ingredients registered in Brazil for ant baits were sulfluramid, fipronil and chlorpyrifos. Chlorpyrifos is no longer used in Brazil as insect baits for control leaf cutting ants. Brazil indicated that sulfluramid could not currently be efficiently replaced since the efficacy of alternatives had not been demonstrated. POPRC concluded that for some countries, it seems possible to replace sulfluramid, but for others, not yet.

10.2. Production, use, import and export of sulfluramid

67. Information is available on the production of sulfluramid in Brazil: 28,684 kg (2013); 30,637 kg (2014); 29,542 kg (2015); 35,511 kg (2016); 35,090 kg (2017); 35,000 kg (2018); 37,290 kg (2019); 33,710 kg (2020); 27,600 (2021). Information on production of sulfluramid in other countries was not found.

68. Four countries indicated the use of PFOSF for the control of leaf-cutting ants in their fourth national report: Bosnia and Herzegovina (2012: 56,000 kg), Brazil (Before 2009: 50,000 kg; 2000: 50,000 kg; 2010: 50,000 kg; 2011: 54,208 kg; 2012: 47,283 kg; 2013: 45,894 kg; 2014: 49,019 kg; 2015: 47,267 kg; 2016: 56,817; and 2017: 56144 kg), Colombia (Before 2009: 46,968 kg; 2014: 2,843 kg; 2015: 1,879 kg), and Trinidad and Tobago (Before 2009: 50 kg; 2009: 50 kg; 2010: 50, kg). Saint Lucia and Suriname have indicated that sulfluramid is no longer used; Trinidad and Tobago reports 0 kg of sulfluramid used in each of 2011, 2012, 2013, and 2014.

69. Table 15 below provides a summary of information on use, import and export of sulfluramid provided by Parties in their national reports, national implementation plans and response to the call for information in 2018 and 2022.

70. While information on production, import, export, and use is limited, what is available indicates that sulfluramid is may still be used in several Latin American countries. could also be used in other countries, which have not registered an acceptable purpose for Insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp.

Table 15. Information on the use, import and export of sulfluramid provided by Parties (source: national reports, national implementation plans and responses to the call for information in 2018)

Party	Use (kg)	Import (kg)	Export (kg)
Argentina	The national implementation plan (2017 update) suggests that 630 kg of sulfluramid were used in 2015.	NIP (2017 update) estimates 725 kg of sulfluramid imported in 2015.	The national implementation plan (2017 update) estimates 94.95 kg sulfluramid exported in 2015
Benin	The national implementation plan (2018 update) estimates 23 kg of sulfluramid was used in 2015.	NIP (2018 update) estimates that 23 kg of sulfluramid were imported from France in 2015	

[32] UNEP/POPS/POPRC.3/20/Add.5; UNEP/POPS/POPRC.14/3.

[33] UNEP/POPS/POPRC.12/INF/15/Rev.1.

Party	Use (kg)	Import (kg)	Export (kg)
Bosnia and Herzegovina	Reported estimated use of 56,000 kg PFOS for insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. in 2012[34]		
Brazil	2013: 27,165 2014: 28,694 2015: 28,069 2016: 33,701 2017: 33,186 2018: 34,030 2019: 37,360 2020: 30,810 2021: 27,770	2018: 0 2019: 0 2020: 0 2021: 0	2013: 1,472.67 2014: 1,884.45 2015: 1,473 2016: 2,038.83 2017: 1,844.76 2018: 800 2019: 890 2020: 1,050 2021: 1,330
Colombia	Before 2009: 46,968 2014: 2,843 2015: 1,879	NIP (2017) reports data for the following years: 2001: 12,000 2002: 25,000 2003: 18,000 2008: 54,000 2009: 54,000 2011: 54,000 2014: 2,843 2015: 1,879	
Côte d'Ivoire		NIP (2016) indicates 33,914.68 kg (net) imported in 2014 as surfactant and active ingredient in pesticides to control termites, cockroaches and other insects.	
Costa Rica		NIP (2015) indicates that a total of 623 kg of sulfluramid have been imported between 2008 and 2013.	
Guatemala		The following amounts of sulfluramid have been imported from Brazil (kg): 2013: 24,000 2014: 29,000 2015: 32,000 (Source: NIP 2016-2025)	
Honduras		NIP (2105 update) indicates that from 2009 to 2013 a total of 140,387.5 kg was imported.	
Panama	The 2017 preliminary PFOS inventory estimated the total amount of insect baits for the control of leaf-cutting ants of *Atta* spp. and *Acromyrmex* spp. to be 45,000 kg.		
Paraguay	The national implementation plan (2017) estimates 3,000 kg of sulfluramid used in 2015.	NIP (2017) indicates: 3,000 kg imported in 2015; a total of 19,000 kg from 2007 to 2015.	
Saint Lucia	According to the 2020 national implementation plan sulfluramid has not been registered for use in Saint Lucia since 1998, and it is not currently on the market		
Suriname	According to the 2019 national implementation plan sulfluramid was used against ants since 2006 and until 2014 and is now prohibited. This was used for ant infestation in residential,	In total 15,000 kg sulfluramid with 0.5 % PFOS content (75 kg PFOS) has been imported to Suriname.	

[34] See note above.

Party	Use (kg)	Import (kg)	Export (kg)
	industrial and commercial areas throughout Suriname.		
Trinidad and Tobago	Trinidad and Tobago reported the following estimates of use: 50 kg (Before 2009), 50 kg (2009), 50 kg (2010), and 0 kg (2011-2014) as Insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp.		

11. Conclusions

71. The main sources of information of the present report are information submitted by Parties in the national reports pursuant to Article 15; national implementation plans pursuant to Article 7; and responses to calls for information following decisions of the Committee and the Conference of the Parties. The accuracy and comprehensiveness of the information used in the present report depend on the ability of Parties to collect and submit such information.

72. As of 1 February 2023, in accordance with relevant provisions of the Convention, the amendment has entered into force for 178 of 186 Parties (96%) to the Stockholm Convention. Of the 178 Parties, 108 Parties (61%) had submitted their national implementation plans reflecting the 2009 amendment for PFOS, its salts and PFOSF. The amendment to Annex B to amend the listing of PFOS, its salts and PFOSF (decision SC-9/4) was adopted at the ninth meeting of the Conference of the Parties in 2019. As of 1 February 2023, the amendment has entered into force for 171 of 186 Parties (92%). The deadline for transmission of revised and updated implementation plans addressing this amendment is 3 December 2022. 14 Parties had submitted their NIPs with regards to this amendment as of 1 February 2023.

73. As of 1 February 2023, 93, 88 and 81 Parties had submitted their third, fourth and fifth national reports, respectively. The low submission rate of national reports is another critical factor of data limitation.

74. Quantitative data are not available in many Parties. Data gaps are notable in developing countries and regions and in countries with economies in transition. Furthermore, there is limited comparability among the available data sets.

75. To allow Parties to review the continued need for acceptable purposes and specific exemptions or to take decisions on withdrawal from the register, it is particularly important for those Parties that have registered for acceptable purposes and specific exemptions for PFOS, its salts and PFOSF to make efforts to obtain quantitative information on the production and/or use of those chemicals.

76. Data available suggest that there has been a significant drop in production and use of PFOS since the voluntary phase out by 3M in 2003. Production started in China in 2001; however, no data were available on current level of production. Stricter legislation and control worldwide are expected to have reduced the use of PFOS over time although uncertainty remains as to the current levels of use of PFOS, its salts and PFOSF taking into account the limited quantitative data available.

77. Among the information made available regarding actions that Parties have taken to phase out the use of PFOS, its salts and PFOSF as alternative substances or methods have become available, one can note that:

(a) In metal plating (hard metal plating) only in closed-loop systems: some Parties report users having switched to PFOS-free chemicals, others that alternatives have been tested but have been found to be less efficient. While suppliers do offer PFOS-free products (e.g., ANKOR Dyne 30 MS MACUPLEX STR NPFX and Proquel Z/A), there are no drop in alternatives that provide all the required properties for all the different applications;

(b) Users tend to switch to PFOS-free fire-fighting foams according to the information provided by various Parties. Caution has been expressed that not only PFOS-containing foams but also non-PFOS containing foams based on other fluorocompounds pose a risk to the environment. Data from national reports suggest that large stocks of foams that potentially contain PFOS remain in many countries;

(c) Since the last evaluation, little added information on effective alternatives to the use of sulfluramid in the control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. in agriculture has been submitted.

78. Further information and data would be needed to cover the gaps in the present report. Through the process for updating the NIPs currently ongoing in a majority of countries, additional information on PFOS, its salts and PFOSF may be obtained. In some cases, information on alternatives is considered as confidential business information making it difficult to assess if the alternatives truly have fewer environmental or health concerns. In others, the alternatives include substances such as PFOA which are subject of growing concern.

79. Only two Parties (Brazil and Viet Nam) have registered for the acceptable purpose “Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf cutting ants from *Atta spp*. and *Acromyrmex spp*. for agricultural use only”. Sulfluramid may still be used in several countries in Latin America, and could also be used in other countries, although these Parties have yet to notify the Secretariat of this use. Leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. is not known to be found in the Asian region including in Viet Nam.

80. In order to correctly reflect the situation of use of PFOS, its salts and PFOSF for the purpose of inset baits for control of insect baits for control of leaf-cutting ants from *Atta* spp. and *Acromyrmex* spp. Parties using sulfluramid for this purpose are encouraged to notify the Secretariat to register for the acceptable purpose.

81. While there are limited data, Löfstedt Gilljam and colleagues (2016a; 2016b) concluded that the agricultural use of sulfluramid in Latin America could be an important source of PFOS into the environment. Two recent studies

provide supporting evidence. Zabaleta and colleague (2018) found that the application of sulfluramid containing baits can lead to occurrence of PFOS in crops and other environmental media (Zabaleta et al., 2018). In their environmental sampling study undertaken in an agricultural area of Bahia State (Brazil), Nascimento and colleagues (2018) concluded that their results support the hypothesis that sulfluramid use contributes to the occurrence of PFASs, including PFOS, in soil, plants, coastal and groundwater. It is important to continue monitoring the presence of sulfluramid and PFOS in the environment.

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