



**Stockholm Convention
on Persistent Organic
Pollutants**

**Conference of the Parties to the Stockholm
Convention on Persistent Organic Pollutants
Ninth meeting**

Geneva, 29 April–10 May 2019

Item 5 (a) (iv) of the provisional agenda*

**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 Convention (UNEP/POPS/COP.9/7), 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.9/1.

Annex**Report on the evaluation of information on perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride****Table of contents**

I.	Introduction.....	3
	A. Background.....	3
	B. Sources of information	3
II.	Entry into force and obligations of the Stockholm Convention	4
III.	Register of acceptable purposes and specific exemptions for PFOS, its salts and PFOSF	4
IV.	Production, use, import and export of PFOS, its salts and PFOSF.....	9
	A. Production	9
	B. Use.....	9
	C. Quantitative information on the production, use, import and export.....	14
V.	Legal or administrative measures to restrict production and use of PFOS, its salts and PFOSF.....	25
VI.	Actions taken to phase out the use of PFOS, its salts and PFOSF.....	32
VII.	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for the specific exemptions and/or acceptable purposes.....	39
VIII.	Capacities for countries to transfer to reliance on alternatives to PFOS, its salts and PFOSF	43
IX.	Sulfuramid.....	44
	A. Background.....	44
	B. Production, use, import and export of sulfluramid.....	44
	C. Local monitoring of releases of PFOS from the use of sulfluramid	46
X.	Conclusions.....	47
	References	49

I. Introduction

A. Background

1. At its fourth meeting, the Conference of the Parties to the Stockholm Convention adopted its decision SC-4/17, through which it decided that the production and use of perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) should be eliminated by all Parties except for the use and production allowed as acceptable purposes and specific exemptions in accordance with Part III of Annex B to the Convention.
2. Paragraph 5 of part III of Annex B to the Convention provides that the Conference of the Parties shall evaluate the continued need for PFOS, its salts and PFOSF for the various acceptable purposes and specific exemptions listed in Annex B on the basis of available scientific, technical, environmental and economic information. In accordance with paragraph 6 of part III of Annex B, 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.
3. As part of the process for the evaluation of PFOS, its salts and PFOSF set out in the annex to decision SC-6/4, amended by decision SC-7/5, and in accordance with the terms of reference set out in the annex to document UNEP/POPS/POPRC/13/INF/9, the present draft report has been prepared by the Secretariat for submission to the Committee at its fourteenth meeting.
4. At its eighth meeting, the Conference of the Parties invited Parties and others to submit to the Secretariat, by 15 February 2018, information on production and use of sulfluramid, local monitoring of releases of PFOS from the use of sulfluramid and research on the development of safe alternatives for use by the Secretariat in preparing its next report on the evaluation of perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride.
5. The Committee is invited to provide comments on the draft report during the meeting. The Secretariat will revise the draft report, taking into account the comments provided by the Committee, and submit the final report to the Conference of the Parties at its ninth meeting.

B. Sources of information

6. 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;¹
 - (b) Information available in the national implementation plans transmitted by Parties pursuant to Article 7 of the Convention;²
 - (c) Information available in the register of specific exemptions³ and acceptable purposes;⁴
 - (d) Information on PFOS, its salts and PFOSF and sulfluramid submitted by Parties and observers in response to the call for information in 2018 following the thirteenth meeting of the Committee;⁵
 - (e) Information submitted by Parties and others in follow-up to decisions POPRC-7/7,⁶ POPRC-8/11,⁷ and POPRC-9/5.⁸

¹ <http://chm.pops.int/tabid/3668/Default.asp>.

² <http://chm.pops.int/tabid/253/Default.aspx>.

³ <http://chm.pops.int/tabid/4644/Default.aspx>.

⁴ <http://chm.pops.int/tabid/794/Default.aspx>.

⁵ <http://chm.pops.int/tabid/6173/Default.aspx>.

⁶ <http://chm.pops.int/tabid/2542/Default.aspx>.

⁷ <http://chm.pops.int/tabid/3064/Default.aspx>.

⁸ <http://chm.pops.int/tabid/3565/Default.aspx>

II. Entry into force and obligations of the Stockholm Convention

7. The Stockholm Convention on Persistent Organic Pollutants entered into force on 17 May 2004. As of 15 December 2018, the number of Parties to the Convention is 182; the number of Parties that have submitted their national implementation plan pursuant to Article 7 is 169 (93%); the number of Parties that have submitted first, second, third and fourth national reports pursuant to Article 15, as of 30 October 2018, are 45, 95, 93 and 60, respectively.

8. The amendment to Annex B to list PFOS, its salts and PFOSF (decision SC-4/17) was adopted at the fourth meeting of the Conference of the Parties in 2009 and communicated by the depositary on 26 August 2009.

9. As of 15 December 2018, in accordance with relevant provisions of the Convention, the amendment has entered into force for 174 of 182 Parties (96%) to the Stockholm Convention. Of the 174 Parties, 79 Parties (45%) have submitted their national implementation plans reflecting PFOS, its salts and PFOSF.

10. The amendment to Annex B to list PFOS, its salts and PFOSF has not entered into force for the following 8 Parties: Australia, Bahrain, Bangladesh, India, Republic of Moldova, Russian Federation, Slovenia and Vanuatu.⁹

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

11. Table 1 provides a list of acceptable purposes and specific exemptions for PFOS, its salts and PFOSF listed in Annex B to the Convention.

Table 1: Acceptable purposes and specific exemptions for PFOS, its salts, and PFOSF listed in Annex B to the Convention

Acceptable purposes	Specific exemptions
<ul style="list-style-type: none"> • Photo-imaging • Photoresist and anti-reflective coatings for semiconductors • Etching agent for compound semiconductors 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 genus <i>Atta spp.</i> and <i>Acromyrmex spp.</i> 	<ul style="list-style-type: none"> • 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*

* No new registrations may be made with respect to this use (decision SC-7/1).

12. In accordance with paragraph 4 of Article 4 of the Convention, unless an earlier date is indicated in the register of specific exemptions for PFOS, its salts and PFOSF 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.

13. At its seventh meeting, the Conference of the Parties noted, pursuant to paragraph 9 of Article 4, that as there are 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

⁹ In accordance with paragraph 3 (c) of Article 22, an amendment to Annex A, B or C to the Convention enters into force for all Parties on the expiry of one year from the date of the communication by the depositary of the adoption of the amendment, except for those that had submitted a notification of non-acceptance in accordance with the provisions of paragraph 3 (b) of Article 22; or a declaration in accordance with paragraph 4 of Article 25, in which case such amendments shall enter into force 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 amendments.

and packaging, coatings and coating additives and rubber and plastics, no new registrations may be made with respect to them.¹⁰

14. 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 PFOSE 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.

15. Tables 2, 3 and 4 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 PFOSE, respectively, as of 15 December 2018. The information on various exemptions is available on the website of the Convention.¹¹

Table 2: Register of acceptable purposes for PFOS, its salts and PFOSE, as of 15 December 2018¹²

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		<ul style="list-style-type: none"> Insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i> 	Perfluorooctane sulphonyl fluoride (PFOS-F) (*)	18/11/2010	(*) Intermediate in the production of sulfluramid, for the production of insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i>
Cambodia			X		<ul style="list-style-type: none"> 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.
Canada			X	10/12/2010	<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> Photo-imaging Photo-resist and anti-reflective coatings for semi-conductors Etching agent for compound semi-conductors and ceramic filters Aviation hydraulic fluids 		18/03/2014	Applicable to Hong Kong SAR and Macau SAR of China

¹⁰ Decision SC-7/1.

¹¹ <http://chm.pops.int/tabid/789/Default.aspx>.

¹² <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				
					<ul style="list-style-type: none"> • Metal plating (hard metal plating) only in closed-loop systems • Certain medical devices • Fire-fighting foam 			
Czech Republic			X		<ul style="list-style-type: none"> • 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		<ul style="list-style-type: none"> • 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. 		31/03/2011	The EU restriction is not limited to PFOS, its salts and PFOS-F 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		<ul style="list-style-type: none"> • Photo-imaging; • Photo-resistant and anti-reflective coatings for semi-conductors; • Etching agent for compound semi-conductors and ceramic filters; • Certain medical devices 	Perfluorooctane-1-sulfonyl fluoride (PFOS-F, CAS No. 307-35-7)	02/09/2010	
Norway			X		<ul style="list-style-type: none"> • 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	
Republic of Korea			X		<ul style="list-style-type: none"> • Photo-imaging • Photo-resist and anti-reflective coatings for semi- 		15/05/2018	

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				
					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)			
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 (AFFF5) 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.
Turkey			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.		12/05/2015	
Vietnam	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;	• 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);	16/04/2013	Vietnam is in the process of PFOS inventory and will update information when available.

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				
					<ul style="list-style-type: none"> • Fire-fighting foam; • Insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i> 	<ul style="list-style-type: none"> • Diethanol-ammonium perfluorooctane sulfonate (CAS no. 70225-14-8); • Tetraethyl-ammonium perfluorooctane sulfonate (CAS no. 56773-42-3); • Didecyl-dimethyl-ammonium perfluorooctane sulfonate (CAS no. 251099-16-8) • Perfluorooctane sulfonyl fluoride (CAS No: 307-35-7). 		
Zambia			X	30/05/2014	<ul style="list-style-type: none"> • 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 3: Withdrawal from the register of acceptable purposes for PFOS, its salts and PFOSF, as of 15 December 2018¹³

Party	Activity	Date of notification	Date of withdrawal	Remarks at date of notification	Withdrawal notification
European Union	Production and use for: <ul style="list-style-type: none"> • Aviation hydraulic fluids 	31/03/2011	09/06/2017	The EU restriction is not limited to PFOS, its salts and PFOF 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.	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.
Norway	Use for: <ul style="list-style-type: none"> • Aviation hydraulic fluids 	28/10/2010	11/10/2017		

Table 4: Register of specific exemptions for PFOS, its salts and PFOSF, as of 31 August 2018¹⁴

Party	Activity	Specific exemption	Expiry date	Estimated quantity of production/use	Purpose(s) of production / use	Reason for exemption	Remarks
China	Production and use	<ul style="list-style-type: none"> • Photo masks in the semiconductor and liquid crystal display (LCD) industries • Metal plating (hard metal plating) 	22/03/2019	Not provided	<ul style="list-style-type: none"> • Photo masks in the semiconductor and liquid crystal display (LCD) industries • Metal plating (hard metal plating) 	Currently in use without appropriate alternatives and transition will take some time	Applicable to Hong Kong SAR and Macau SAR of China

¹³ <http://chm.pops.int/tabid/794/Default.aspx>.

¹⁴ <http://chm.pops.int/tabid/4644/Default.aspx>.

		<ul style="list-style-type: none"> • 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. 			<ul style="list-style-type: none"> • 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. 		
--	--	---	--	--	---	--	--

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

A. 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.^{15,16} Since that time, China has become a major producer of PFOS. According to the China Association of Fluorine and Silicone Industry, PFOS production in China has 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 2008.¹⁷

17. The following Parties have registered for production of PFOS, its salts and PFOSF for the acceptable purposes under the Convention: Brazil, China, European Union, Japan and Vietnam; and for specific exemptions: China, European Union, Vietnam. The specific exemptions for the European Union and Vietnam expired in 2015.

18. In their national reports, Belgium, China, Germany and Japan reported past or current production of PFOS, its salts and PFOSF. China reported that production started in 2001; Japan reported that production ended in 2010. In their response to 2018 call for information, the European Union indicated there is no current production (no date given); Germany indicated production was 9 tons/year until 2015, and zero in 2016.

19. No other Parties reported that any production of PFOS, its salts and PFOSF, including Brazil and Vietnam that are in the register of acceptable purposes for production of those chemicals.

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

B. Use

21. Table 5 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 call for information in 2018.

¹⁵ UNECE 2006. Overview of Existing Information on PFOS Production, Use, Emissions and Pathways to the Environment and Cost/Benefits with alternatives/substitutes.

¹⁶ Carloni D. 2009. Perfluorooctane Sulfonate (PFOS) Production and Use: Past and Current Evidence. Report prepared for UNIDO. December 2009.

¹⁷ Jun Huang, Gang Yu Shengfang Mei, 2013, PFOS in China: Production, Application & Alternatives. UNEP-CHW-SUBM-GUID-TGsPOPsWastes-PFOS-UNEPChemicals-RefJunHuangChina-201310.English. <http://www.basel.int/Implementation/POPsWastes/TechnicalGuidelinesarchives/tabid/2381/>

Table 5: 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 call for information in 2018)

	Used in the past ¹⁸	Currently used ¹⁹	Never used or information not available
Acceptable purposes			
Photo-imaging	Germany, Japan	Australia, Czech Republic, Switzerland, Turkey	Armenia, Belarus, Belgium, Bolivia, Bosnia & Herzegovina, Brazil, Chile, Cyprus, Democratic Republic of Congo (DRC), Denmark, El Salvador, Finland, Georgia, Guyana, Ireland, Madagascar, Monaco, Nicaragua, Oman, Peru, Rwanda, Singapore, Sao Tome and Principe, Serbia, Sweden, Thailand, The former Yugoslav Republic of Macedonia (TFYRM), Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, Canada, China, Colombia, Cuba, France, Ghana, Indonesia, Lebanon, New Zealand, Norway, Republic of Korea, Romania, Slovenia, Spain, Sudan
Photo-resist and anti-reflective coatings for semi-conductors	Germany, Japan, Singapore	Austria, Czech Republic, Switzerland, Turkey	Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Chile, Cyprus, DRC, Denmark, El Salvador, Georgia, Guyana, Ireland, Madagascar, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Sweden, Thailand, TFYRM, Trinidad and Tobago, United Arab Emirates, United Kingdom, Yemen, Bosnia & Herzegovina, Canada, China, Colombia, Cuba, Czech Republic, Finland, France, Ghana, Indonesia, Lebanon, New Zealand, Norway, Republic of Korea, Romania, Slovenia, Spain, Sudan
Etching agent for compound semiconductors and ceramic filters	Japan	Czech Republic, Switzerland, Turkey	Armenia, Australia, Austria, Belarus, Belgium, Brazil, Chile, Cyprus, DRC, Denmark, El Salvador, Germany, Georgia, Guyana, Ireland, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Bosnia & Herzegovina, Canada, China, Colombia, Czech Republic, Finland, France, Ghana, Indonesia, Lebanon, Madagascar, New Zealand, Norway, Republic of Korea, Romania, Slovenia, Spain, Sudan
Aviation hydraulic fluids	Czech Republic, European Union, Germany, Japan, New Zealand, Norway, Sudan, Sweden	Switzerland, Turkey	Armenia, Australia, Belarus, Belgium, Bolivia, Bosnia & Herzegovina, Brazil, Chile, Cyprus, Czech Republic, DRC, Denmark, El Salvador, Georgia, Guyana, Ireland, Lebanon, Madagascar, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, Canada, China, Colombia, Cuba, Finland, France,

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”.

	Used in the past ¹⁸	Currently used ¹⁹	Never used or information not available
			Ghana, Indonesia, Republic of Korea, Romania, Slovenia, Spain
Metal plating (hard metal plating) only in closed-loop systems	Belgium, Canada, Japan, New Zealand, Singapore	Austria, Australia, Czech Republic, Denmark, Finland, Germany, Norway, Slovenia, Sweden, Switzerland, Turkey, United Kingdom	Armenia, Belarus, Bolivia, Brazil, Chile, Cyprus, DRC, El Salvador, Georgia, Guyana, Ireland, Lebanon, Madagascar, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, Yemen, Bosnia & Herzegovina, China, Colombia, Cuba, Czech Republic, France, Ghana, Indonesia, Republic of Korea, Romania, Spain, Sudan
Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters)			Armenia, Australia, Austria, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Germany, Georgia, Guyana, Ireland, Japan, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Bosnia & Herzegovina, China, Colombia, Cuba, Czech Republic, Finland, France, Ghana, Indonesia, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Fire-fighting foam	Bosnia & Herzegovina, Czech Republic, Finland, Germany, Indonesia, Japan, Madagascar, New Zealand	Australia, Cambodia, Lebanon, Switzerland	Armenia, Belgium, Bolivia, Brazil, Chile, Cyprus, DRC, Denmark, El Salvador, France, Georgia, Guyana, Ireland, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, Belarus, Canada, China, Colombia, Cuba, France, Ghana, Republic of Korea, Romania, Slovenia, Spain
Insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i>	Bosnia and Herzegovina, Trinidad & Tobago	Brazil, Colombia	Armenia, Australia, Austria, Belarus, Belgium, Bolivia, Canada, Chile, Cyprus, Czech Republic, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Indonesia, Ireland, Japan, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, United Arab Emirates, United Kingdom, Yemen, China, Cuba, France, Ghana, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Specific exemptions			
Photo masks in the semiconductor and liquid crystal display (LCD) industries			Armenia, Australia, Austria, Belarus, Belgium, Bolivia, Brazil, Chile, Cyprus, DRC, Denmark, El Salvador, Germany, Georgia, Guyana, Ireland, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, Yemen, Bosnia & Herzegovina, Canada, China, Colombia,

	Used in the past ¹⁸	Currently used ¹⁹	Never used or information not available
			Cuba, Czech Republic, Finland, France, Ghana, Indonesia, Japan, Lebanon, New Zealand, Norway, Republic of Korea, Romania, Slovenia, Spain, Sudan, United Kingdom
Metal plating (hard metal plating)	Brazil, Canada, Belgium, Czech Republic, Finland, New Zealand, Switzerland	Australia, Turkey	Armenia, Belarus, Bolivia, Chile, Cyprus, DRC, Denmark, El Salvador, Germany, Georgia, Guyana, Ireland, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, Yemen, Austria, Bosnia & Herzegovina, China, Colombia, Cuba, Denmark, Finland, France, Ghana, Indonesia, Japan, Lebanon, Republic of Korea, Romania, Slovenia, Spain, Sudan, United Kingdom
Metal plating (decorative plating)	Brazil, Canada, Czech Republic, New Zealand, Sweden, Switzerland	Australia, Turkey,	Armenia, Belarus, Belgium, Bolivia, Chile, Cyprus, DRC, Denmark, El Salvador, Georgia, Germany, Guyana, Ireland, Lebanon, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, Yemen, Austria, Bosnia & Herzegovina, China, Colombia, Cuba, Finland, France, Ghana, Indonesia, Japan, Republic of Korea, Romania, Slovenia, Spain, Sudan, United Kingdom
Electric and electronic parts for some colour printers and colour copy machines			Armenia, Australia, Austria, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Germany, Georgia, Guyana, Ireland, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Bosnia & Herzegovina, China, Colombia, Cuba, Czech Republic, Finland, France, Ghana, Indonesia, Japan, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain
Insecticides for control of red imported fire ants and termites			Armenia, Australia, Austria, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Indonesia, Ireland, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Bosnia & Herzegovina, China, Colombia, Cuba, Czech Republic, France, Ghana, Indonesia, Japan, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Chemically driven oil production			Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland,

	Used in the past ¹⁸	Currently used ¹⁹	Never used or information not available
			Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, Bosnia & Herzegovina, China, Colombia, Cuba, Czech Republic, France, Ghana, Indonesia, Japan, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Carpets	Bosnia & Herzegovina, Indonesia		Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, China, Colombia, Cuba, Czech Republic, France, Ghana, Japan, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Leather and apparel			Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Lebanon, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, Bosnia & Herzegovina, China, Colombia, Czech Republic, France, Ghana, Indonesia, Japan, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Textiles and upholstery	Bosnia & Herzegovina, Indonesia, Madagascar		Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, Yemen, Austria, China, Colombia, Cuba, Czech Republic, France, Ghana, Japan, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Paper and packaging	Indonesia		Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Lebanon, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, Bosnia & Herzegovina, China, Colombia, Cuba, Czech

	Used in the past ¹⁸	Currently used ¹⁹	Never used or information not available
			Republic, France, Ghana, Japan, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Coatings and coating additive	Bosnia & Herzegovina		Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Lebanon, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, China, Colombia, Cuba, Czech Republic, France, Ghana, Indonesia, Japan, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Rubber and plastics	Bosnia & Herzegovina		Armenia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Lebanon, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Sweden, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, China, Colombia, Cuba, Czech Republic, France, Ghana, Indonesia, Japan, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan
Others			
Other uses such as cleaning agent	Bosnia & Herzegovina, Sweden		Armenia, Australia, Belarus, Belgium, Bolivia, Brazil, Canada, Chile, Cyprus, DRC, Denmark, El Salvador, Finland, Germany, Georgia, Guyana, Ireland, Madagascar, Norway, Monaco, Nicaragua, Oman, Peru, Rwanda, Sao Tome and Principe, Serbia, Singapore, Switzerland, Thailand, TFYRM, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Austria, China, Colombia, Czech Republic, France, Ghana, Indonesia, Japan, Lebanon, New Zealand, Republic of Korea, Romania, Slovenia, Spain, Sudan

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

22. No Parties have reported quantitative information on the production of PFOS, its salts and PFOSF in their national reports or national implementation plans. In the responses to the call for information in 2018, Germany indicated production of nine tons per year until 2015, and none in 2016.

23. Table 6 summarizes latest available quantitative information on the use, import and export provided by Parties in their national reports, national implementation plans and responses to the call for information in 2018.

Table 6: Quantitative information on the use, import and export of PFOS, its salts and PFOSE provided by Parties (source: national reports, national implementation plans and responses to the call for information in 2018)

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		
Argentina	The national implementation plan (2017 update) estimates average amount of PFOS, its salts and PFOSE 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.	The national implementation plan (2017 update) estimates 94.95 kg sulfluramid exported in 2015.
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.		
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 (2250-4500 kg/year); paper and cardboard manufacturing (1436 kg/year); coatings: (11.6 kg/year) and an estimated use of 23 kg of sulfluramid in 2015.		
Bosnia & 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 <i>Atta spp.</i> and <i>Acromyrmex spp.</i> ; 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 PFOSE for the production of insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i> at a constant level of around 50,000 kg	Import from China: 2013: 50,000 kg 2014: 50,000 kg 2015: 47,267 kg 2016: 56,817 kg	

²⁰ While this amount was provided in the national report (4th cycle) of Bosnia & 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
	per year from before 2009 to 2017 (range 45894 to 56817 kg); 1,876 kg/year was used in 2011 for hard metal plating.	2017: 63,760 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 2541 tons for an estimated 38,109 kg of PFOs.		
Canada	Reported estimated use of PFOS in metal plating (hard metal plating) only in closed-loop systems at levels of 28.78 kg in 2009, 25.82 kg in 2010, 5.64 kg in 2011, 8.75 kg in 2012, 1.64 kg in 2013 and 0 in 2014. Domestically this use has been prohibited since 2009. 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 C6 chemistry.	The import of PFOS and products containing PFOS is prohibited under the <i>Prohibition of Certain Toxic Substances Regulations, 2012</i> with certain exceptions (e.g., laboratory use and incidental presence)	
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.	.	
Colombia	The national report (4 th cycle) estimates 46,968 kg of PFOS use in insect baits before 2009, 2843 kg in 2014 and 1879 kg in 2015. 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).	Reports imports from Brazil of 54000 kg in each of 2008, 2009, and 2011. Also 12000 kg in 2001, and 16945 kg in 2003, origin unknown.	
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	The national implementation plan	

Party	Use / Stockpiles	Import	Export
	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).	(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.
Czech Republic	The national implementation plan (2012 update) indicates that PFOS compounds have never been produced in the Czech Republic. No information is available on stocks. The national report (4 th cycle) has the following estimates of use: in photo-imaging – 1425 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.	Reported imports between 10 to 28 kg from Germany for use in 2010.	
European Union	ESWI (2011) ²¹ estimates current uses as follows: the metal plating industry (6,500 kg/y), hydraulic fluids (730 kg/y), photographic industry (562 kg/year used +~1,280 kg from historical storage), semiconductor industry (9.3 kg/year), and fire-fighting foams (90 tons in stocks). Total sources 163 t/year and 1,730 tons in products ²² (mainly from carpets). Certain medical devices: The use was about 150 kg of pure fluorinated substances in Finland, Denmark and Sweden in 2011.	According to ESWI (2011): No information available, except for the photo industry: finished articles containing PFOS account for 150 kg/year.	According to ESWI (2011): No information available, except for the photo industry: finished articles containing PFOS account for 250 kg/year.
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.		
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).	

²¹ Consortium ESWI Expert Team to Support Waste Implementation 2011. Study on waste related issues of newly listed POPs and candidate POPs. Service request under the framework contract No ENV.G.4/FRA/2007/0066. Draft final report. 13 April 2011.

²² Represents the existing stock of the substance in product in use.

Party	Use / Stockpiles	Import	Export
Germany	<p>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, 3400 kg in metal plating (hard metal plating) in closed-loop systems, and 25000 kg in fire-fighting foam. Total use of PFOS in Germany in 2010: 28.527 tons.</p> <p>Use before 2009 was estimated at 916384kg for fire-fighting foam and 1883 kg for hard metal plating in closed-loop systems.</p>		<p>2010, 4182 kg to Argentina, Australia, Brazil, China, Republic of Korea, Malaysia, Singapore, Turkey, United States of America, South Africa</p> <p>2011, 10360 kg to Australia, Brazil, Switzerland, China, Republic of Korea, Malaysia, Singapore, Turkey, United States of America, South Africa</p> <p>2012, 240 kg to South Africa</p> <p>2013, 5767 kg to Australia, Brazil, Switzerland, China, India, Republic of Korea, Singapore, Thailand, Turkey, United States of America, South Africa</p> <p>2014, 2359 kg to Australia, Bosnia and Herzegovina, Brazil, China, India, Republic of Korea, Singapore, Turkey, United States of America, South Africa</p> <p>2015, 1000 kg to United Arab Emirates, Australia, Switzerland, China, India, Republic of Korea, Singapore, Turkey, United States of America, South Africa</p> <p>2016, 1425 kg to Australia, Brazil, Switzerland, Republic of Korea, Turkey, South Africa</p> <p>2017, 22.5 kg to Republic of Korea</p>
Guinea	<p>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.</p>	<p>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.</p>	
Guinea Bissau	<p>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.</p>		
Honduras	<p>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.</p>		
Indonesia	<p>Reported an estimated annual use of 103,137 kg before 2009 increasing to</p>		

Party	Use / Stockpiles	Import	Export
	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; reported use of 94, 672 kg per year before 2009m 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, United Kingdom, Japan 2011: 0.73 kg from Belgium 2012: 0.25 kg from Belgium	
Japan	Reported past use of PFOS for photo-resist (5500 kg before 2009) and anti-reflective coatings for semi-conductors (3.318 kg in 2009) and in etching agent for compound semiconductors and ceramic filters (12.4 kg in 2009). In 2018 Japan reported: 1. Salts of perfluoro(octane-1-sulfonic acid): Used 2.652 kg for manufacturing resist materials in 2010. 2. Ammonium salt of perfluoro(octane-1-sulfonic acid): Used 13kg in 2010 and 0.5 kg in 2011 for manufacturing etching agents. Japan's NIP ²³ cites a survey conducted in 2011, according to which approximately 1.5 tons (approximately 30 kg in PFOS equivalent) of PFOS or its salts in stock were identified for use in the etching agent and photosensitive film of semiconductors. According to the survey conducted by the relevant ministry, a total of approximately 12 tons (amount of PFOS or its salts contained) of the foam extinguishing agents containing PFOS were identified.		Salts of perfluoro(octane-1-sulfonic acid)(CAS:1763-23-1) Exported to China as resist materials for semiconductors in FY2010. Exported amount is 2.058 kg (content in resist material)
Kenya	The national implementation plan (2014 update) estimates 460 kg/year of PFOS released from the use of fire-fighting foams.		
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	

²³ Japan. 2012. The National Implementation Plan of Japan under the Stockholm Convention on Persistent Organic Pollutants. August 2012.

Party	Use / Stockpiles	Import	Export
		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.		
Madagascar	Reported use of 1,404 kg in fire-fighting foam and 10,500 kg in textiles and upholstery manufacture in 2014.		
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); 2766.02 kg (2012); 1696 kg (2013); 2370.38 kg (2014); and 1792.68 kg (2015).		
Morocco		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.	
Netherlands	According to the RHDHV (2013) ²⁴ : 145-150 kg was the estimated amount of PFOS used in mist suppressants in the metal plating industry, several kg in photo-resist or anti-reflecting coatings in the semi-conductor industry, 0 kg in photolithographic procedures in the photographic		

²⁴ Royal HaskoningDHV (RHDHV) 2013. Inventory on the use of PFOS in the Netherlands. Report prepared for the Ministry of Infrastructure and Environment of the Netherlands. 9 July 2013.

Party	Use / Stockpiles	Import	Export
	industry, and 0 kg in hydraulic fluids in the aviation industry.		
Nicaragua		Reports imports from Brazil, 20,000 kg in both 2017 and 2018.	
Nigeria	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		Total amount of PFOS and PFOS related substances that have been imported in the period 2010-2013 are estimated as follows: 2010: CAS No. 2991-51-7: 3.4 kg; CAS No. 2795-39-3: 0.17 kg 2011: CAS No. 2991-51-7: 6.8 kg; CAS No. 2795-39-3: 0.018 kg 2012: CAS No. 2991-51-7: 2.2 kg; CAS No. 2795-39-3: 1.1 kg 2013: CAS No. 2991-51-7: 0.18 kg Norway reported import of PFOS-containing product for hard metal plating. The product contains CAS No. 56773-42-3. Total amount of this substance imported to Norway: 2-10 kg/year	
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 (sulfloramid). Stocks of PFOS are estimated at 21,465,000 kg.		
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).		
Sao Tome and Principe	In the 2015 inventory, the national implementation plan update reports 37-307 kg of PFOS in fire-fighting foams.		

Party	Use / Stockpiles	Import	Export
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.	Estimated export of 400 kg to Malaysia for use in 2014.
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 contain 1,296 kg of PFOS; Quantities of PFOS in wastes/contaminated sites are estimated at 80,988 kg.	The national implementation plan (update) indicates that 86.4 kg of PFOS were imported.	
Slovenia	Reported estimated use of 480 kg in metal plating (hard metal plating) only in closed-loop systems before 2009.		
South Africa		Reported imports for use from Spain, India, Japan, Republic of Korea, United States of America of 75,357 kg (no year stated).	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.		
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 systems was of 200 kg/year prior to 2010, 180 in 2011, 2012, and 2013, 80 in 2014, 60 in 2015, and 25 in 2016. 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.	Sweden has an ongoing use of PFOS in hard metal plating, with an annual import of about 180 kilograms. Reported imports for use from Germany of 180 kg in 2012 and 25 kg in 2016	
Switzerland	Reported the following use estimates: Photo-imaging – 2011, 1 kg, 2012, 0kg, 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,	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).	

Party	Use / Stockpiles	Import	Export
	<p>300 kg, 2012, 0.2 kg, 2013, 36 kg; Fire-fighting foam – 2011, 6100 kg, 2012, 1000 kg, 2013, 736 kg. According to the NIP²⁵, 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</p>		
Trinidad & Tobago	Reported the following estimates of use: 50 kg (Before 2009), 50 kg (2009) and 50kg (2010) in insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i>		
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.		
Turkey	<p>There are no data available on PFOS wastes, stockpiles and PFOS contaminated sites. The national implementation plan (2016 update) estimated the amount of PFOS used in the country by taking the difference between the import and export amounts (in kg for the year 2011) for the 2923.90.00.90.19 HS Coded chemical: 937 (2008); 809 (2009); 804 (2010); 717 (2011); and 966 (2012).</p> <p>Depending of on the assumptions the estimated amount of PFOS used ranged from 63 to 6,286,617 kg in 2011 in the following priority sectors: textiles, apparel, synthetic carpets, paper-cardboard, and aviation hydraulic fluids.</p>	It is assumed that PFOS and related substances are imported to the country under the 2923.90.00.90.19 HS Code. However, the exact amount of PFOS imported under the 2923.90.00.90.19 HS Code is not known (2016 NIP update).	
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 are imported per year, including 0.415 –	

²⁵ Federal Office for the Environment (FOEN). 2012. Switzerland's first update of the National Implementation Plan under the Stockholm Convention. 22 August 2012.

Party	Use / Stockpiles	Import	Export
		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.		
United Kingdom	Notifications for PFOS indicate the following amounts in stockpiles mostly containing tetraethylammonium perfluorooctane sulfonate (CAS No: 56773-42-3): 2015: 131 kg 2016: 62 kg 2017: 120.23 kg	Information supplied by HM Revenue & Customs indicates that in 2017 the UK arrived (imported) 2 kg of perfluorooctane sulphonic acid (PFOS) from Germany and 99,300 kg from Italy.	Information supplied by HM Revenue & Customs indicates that in 2017 the UK has dispatched (exported) 30 kg of perfluorooctane sulphonic acid (PFOS) to Spain.
Vietnam	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).		
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.		

V. Legal or administrative measures to restrict production and use of PFOS, its salts and PFOSE

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

26. According to the information from the 3rd and 4th national reports, [34] of [96] Parties that submitted national reports report that they have not put in place any legal or administrative measures to address PFOS, its salts and PFOSE; nine of these indicate that measures are in preparation.

Table 7: Information on legal or administrative measures to restrict the production and use of PFOS, its salts and PFOSE provided by Parties (source: national reports and national implementation plans)

Party	Legal or administrative measures to address PFOS, its salts and PFOSE
Albania	<p>Law no. 9263, dated 29.7.2004, "For Adherence of the Republic of Albania to the Stockholm Convention".</p> <p>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.</p> <p>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.</p> <p>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.</p>
Antigua and Barbuda	Restriction in accordance with Annex B (2012).
Argentina	Restriction in accordance with Annex B (2011).
Armenia	Currently being developed
Australia	<p>Prohibition on imports and exports: "Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride 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:</p> <ul style="list-style-type: none"> (a) Potassium perfluorooctane sulfonate; (b) Lithium perfluorooctane sulfonate; (c) Ammonium perfluorooctane sulfonate; (d) Diethanolammonium perfluorooctane sulfonate; (e) Tetraethylammonium perfluorooctane sulfonate; (f) Didecylmethylammonium perfluorooctane sulfonate; (g) N ethylperfluorooctane sulfonamide; (h) N methylperfluorooctane sulfonamide; (i) N ethyl N (2 hydroxyethyl) perfluorooctane sulfonamide; (j) N (2 hydroxyethyl) N methylperfluorooctane sulfonamide; (k) Perfluorooctane sulfonyl fluoride; <p>without approval."</p>
Austria	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.

Party	Legal or administrative measures to address PFOS, its salts and PFOSE
Belarus	Restricted in accordance with Annex B, 2010 (refer to: Decree of the President of the Republic of Belarus № 594 26.12.2003 “On Acceding of the Republic of Belarus to the Stockholm Convention on Persistent Organic Pollutants”).
Belgium	Prohibition on production, import and export. 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.
Bolivia (Plurinational State of)	No legal or administrative measures taken.
Bosnia & 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	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.
Cambodia	Prohibited production, import and export (2004).
Cameroon	Prohibition on production, imports and all uses (2017)
Canada	Prohibition on production, uses, import in accordance with Annex B (2008). "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 to Annex B (2014).
Colombia	Currently being developed.
Costa Rica	No legal or administrative measures taken.
Côte d'Ivoire	No legal or administrative measures taken.
Croatia	Restriction in accordance with Annex B (2012). "Law on Ratification of the Stockholm Convention (OG-IT 2/2007). All updated national and EU legislation on POPs are available in the Second National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants in the Republic of Croatia (2016). 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

Party	Legal or administrative measures to address PFOS, its salts and PFOF
	Regulation (EC) No. 689/2008 concerning export and import of the dangerous chemicals. National legislation concerning mentioned EU Regulations are implementing acts as follows: (a) Law on REACH Regulation implementation (OG 53/2008 and 18/2013), (b) Law on POP Regulation (OG 143/2013); (c) PIC Regulation is implemented by Law on PIC Regulation (OG 139/2010 and 25/2013).
Cuba	No legal or administrative measures taken.
Cyprus	Restricted in accordance with Annex B with production, import, export and use prohibited (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).
El Salvador	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).
Eretria	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	<p>PFOS, its salts and PFOF 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 2011, PFOS, its salts and PFOF were deleted from Annex XVII and are now regulated under Regulation (EC) No 850/2004 on persistent organic pollutants as amended by Commission Regulation (EU) No 757/2010 of 24 August 2010.</p> <p>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.²⁶</p> <p>Production, marketing and use of PFOS may thus only take place for:</p> <ul style="list-style-type: none"> (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: <ul style="list-style-type: none"> (i) Until 26 August 2015: wetting agents for use in controlled electroplating systems; (ii) Photoresists or anti reflective coatings for photolithography processes;

²⁶ http://ec.europa.eu/enterprise/sectors/chemicals/reach/restrictions/index_en.htm.

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
	<p>(iii) Photographic coatings applied to films, papers, or printing plates;</p> <p>(iv) Mist suppressants for non-decorative hard chromium plating in closed loop systems;</p> <p>(v) Hydraulic fluids for aviation.</p> <p>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.</p> <p>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.</p> <p>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.</p>
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).
Georgia	All uses prohibited.
Germany	<p>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</p> <p>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 PFOS-F but covers all PFOS derivatives defined as C8F17SO2X.</p>
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 is 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, 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.
Guatemala	No legal or administrative measures taken.
Guinea	Currently being developed.
Guyana	Guyana prohibited production, use, import and export in 2014.
Honduras	No legal or administrative measures taken. Need for the adoption of measures identified in the national implementation plan.
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 №259) and Ecological Code (9 January 2007 №212) articles 239, 280, 288 and 298 banned production, use, import and export of POPs.
Kyrgyzstan	No legal/administrative measures taken.
Latvia	Latvia prohibited all uses in 2010. See Regulation (EC) No.757/2010.

Party	Legal or administrative measures to address PFOS, its salts and PFOSE
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 PFOSEs 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.
Madagascar	No legal or administrative measures taken.
Mali	No legal or administrative measures taken.
Mauritius	Under development.
Mexico	No legal or administrative measures taken.
Monaco	Restrictions in effect since 2004 are in accordance with Annex B.
Mongolia	Prohibited use and imports in 2012.
Montenegro	Regulations in effect before 2001 are in accordance with Annex B. Production, use, imports and exports are prohibited.
Morocco	No legal or administrative measures taken.
Myanmar	As of 2012, restricted in accordance with Annex B.
Nepal	No legal or administrative measures taken.
Netherlands	Restricted in accordance with Annex B: EU POP regulation (EC) 850/2004 governs the production, use and import of PFOSE. 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	No legal or administrative measures taken.
Nigeria	Restricted in accordance with Annex B. Effective 2010, production and import of PFOSE are prohibited. While Nigeria is not a producer, regulatory actions are being taken to discourage import/export of banned POPs.
Norway	<p>Restricted in accordance with Annex B, starting in 2011: see regulation (EC) No 552/200. Production was prohibited initially in 2009 through regulation (EC) No 552/2009. As of 19 December 2013, use and production are regulated by (EC) 850/2004 through Commission Regulation (EC) No 757/2010.</p> <p>As of 2007, the Norwegian product regulations prohibit fire-fighting foam that contains 0,001 per cent by weight or more of PFOSE or PFOSE related compounds. Fire-fighting foam that contains 0,001 per cent by weight or more of PFOSE or PFOSE related compounds is to be delivered to an approved facility for destruction.</p> <p>The Norwegian product regulations §2-30, and from November 2013 the Norwegian product regulation §4-2, prohibit exportation of PFOSE.</p>
Oman	Production, use, import and export are prohibited as of 2009.
Peru	No legal or administrative measures taken.
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).
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 PFOSE, its salts and PFOSEF.
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 PFOSE prohibited.
Saint Lucia	No legal or administrative measures taken.

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
Sao Tome & Principe	No legal or administrative measures taken.
Serbia	As of 2012, restricted in accordance with Annex B.
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 (2010). 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.
South Africa	No legal or administrative measures taken.
Spain	<p>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 August 25, 2010 and containing PFOS as a constituent will be allowed.</p> <p>Production and sale are authorized for the following specific uses:</p> <ul style="list-style-type: none"> (a) As photosensitive resins or antireflective coatings for photolithographic processes. (b) As coatings applied in photography to films, paper or plates for printing; (c) As mist suppressant for hardened non-decorative chromium plating (chrome VI) in closed-loop systems; (d) As hydraulic fluids for aviation. <p>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.</p>
Sri Lanka	Under development.
Sudan	No legal or administrative measures taken.
Sweden	<p>Restricted in accordance with Annex B (2010). Prohibition on production (2010), exports (2010) and uses (2008).</p> <p>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.</p> <p>There has been no manufacture in Sweden.</p> <p>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 remain.</p>
Switzerland	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>

Party	Legal or administrative measures to address PFOS, its salts and PFOSF
Thailand	Restriction in accordance with Annex B: 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.
The former Yugoslav Republic of Macedonia	Restriction in accordance with Annex B (2011). Prohibition on production, import, and export. See List of bans and restrictions on use of chemicals (Official Gazette No. 57/11, 67/12, 163/13, 31/14). 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.
Trinidad & Tobago	Restriction in accordance with Annex B (2010). Production and export are prohibited. Use according to an exemption registered under the Stockholm Convention. There is no production in Trinidad and Tobago.
Tunisia	No legal or administrative measures taken.
Turkey	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.
United Arab Emirates	Production, import, export and all uses are prohibited (2002).
United Kingdom	Restricted in accordance with Annex B (2007).
Uruguay	No legal or administrative measures taken. To be addressed during the update of the national implementation plan.
Venezuela (Bolivarian Republic of)	No legal or administrative measures taken.
Vietnam	No legal or administrative measures taken.
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).

VI. 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 alternative substances or methods are available.

28. Table 8 provides a summary of latest available information on the actions taken to phase out the use of PFOS, its salts and PFOSF provided by Parties in their national reports and national implementation plans.

Table 8: Information on the actions taken to phase out the use of PFOS, its salts and PFOSF provided by Parties (source: national reports and national implementation plans)

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
Photo-imaging	<p><u>Austria</u>: General Switch to digital imaging</p> <p><u>Canada</u>: It is estimated that a very small quantity of PFOS and related substances may still be contained in photographic products used annually in Canada. Therefore, an exemption is currently in place for this use. However, it is expected that this mass is declining rapidly as users move further towards digital imaging.</p> <p><u>Japan</u>: Substitution is complete.</p> <p><u>Netherlands</u>: PFOS not used, Alternative unknown.</p> <p><u>Sweden</u>: Photographic film continue to disappear, and the present use is practically limited to special products (medical uses and similar (scientific)). The total amount of PFOS in films imported to Sweden is estimated to be a few grams in 2013.</p>
Photo-resist and anti-reflective coatings for semi-conductors	<p><u>Austria</u>: Use of PFOS was phased out in 2015.</p> <p><u>Canada</u>: Globally, the use of PFOS in this sector has been discontinued and replaced with PFOA and other LC-PFCAs.</p> <p><u>Ireland</u>: In 2006, the World Semiconductor Council (WSC) announced a plan to end non-critical uses of perfluorooctyl sulfonate (PFOS) chemicals in semiconductor manufacturing and to work to identify substitutes for PFOS in all critical uses. Very small amounts of PFOS compounds are critical ingredients in leading edge photo-resists and anti-reflective coatings, materials used in the photolithographic process for imprinting circuitry on silicon wafers. PFOS is used in photo-resist either as a photo-acid generator or a surfactant. Photo-acid generators are used in photo-resists for 248nm and shorter wavelengths which rely on chemical amplification. During exposure, the photo-acid generator forms an acid catalyst which aids in creating the desired image that is to be patterned onto the silicon wafer. Photo-acid generators used for this purpose are typically sulfonic acids and PFOS has been the most effective chemical that provides the necessary acidity and stability. In terms of surfactants, surface tension can produce unwanted thickness variations that emanate from the center of the silicon wafer during the spin-on application of the resist. PFOS is particularly effective in lowering the surface tension, reducing thickness variation, and also creating more uniform films.</p> <p>Under the Stockholm Convention the ‘acceptable purpose’ which allowed for the continued use of PFOS was defined as ‘photo-resist and anti-reflective coatings for semiconductors’. While availing of this exemption for critical applications where no replacement was available, other uses of PFOS at the semiconductor manufacturing facility located in Ireland had previously been eliminated prior to 2010. Since 2010 this facility has been striving to eliminate the small uses of PFOS in these remaining critical applications.</p> <p>A total of nine photolithography process steps were re-designed at the facility thereby reducing PFOS use from less than 3 kilograms per year in 2010 to less than 300 grams by the end of 2012. The final and most challenging process step to re-design was not completed before the technology reached end of life at the facility in 2013. The re-design of each process step had to be addressed individually as each process step has its own unique set of chemistries and process and design specifications that need to be met and, in each case, the mostly suitable alternate resist chemistry had to be identified. The facility has now been re-furbished and</p>

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	<p>is running the latest company technology which was designed from the outset to be PFOS free.</p> <p>In general terms replacement of PFOS has been achieved through a variety of means including the use of shorter-chain compounds (C-4 to C-1 carbon chains), the use of non-fluorinated substitutes and the elimination of the surfactant function within the photo-resist.²⁷</p> <p><u>Japan</u>: Substitution is complete.</p> <p><u>Netherlands</u>: Within the semi-conductor industry, every product has its own specific applications. Therefore, for every product, a PFOS-free alternative has to be developed. The industry, together with suppliers, is working on PFOS-free solutions, however industry claims that they need more time to develop a full range of qualitatively comparable alternatives.</p> <p><u>Sweden</u>: No production of photoresist exists in Sweden. No PFOS is remaining in today's import of photoresist.</p> <p>The amount of PFOS in resists usually have been of the magnitude of 0,05-0,1 % which means that PFOS may or may not be declared in the MSDS (depending on who made the MSDS - minor constituents are to be reported only if they contain some hazardous property).</p> <p>In the MSDS for liquid resist there are no statements about PFOS as a component. On a special request for an MSDS on film resist, PFOS was not included in the specification either.</p> <p>One cannot exclude that information from the manufacturers is insufficient or even faulty but with reference to the general PFOS debate it might be more likely that the (international) manufacturers of photoresist actually have substituted PFOS. A substitution to polyfluorinated compounds in photoresist seems likely to have occurred.</p> <p>The situation for the use of PFOS as desmear is a bit unclear. From the suppliers of chemicals to the printed circuit manufacturers it is stated that no PFOS is sold. One of the suppliers claims that PFOS may be omitted by a smaller change in technique when the wafers are cleaned and another one states that PFOS-free desmear has been marketed before. This has not been verified by the manufacturers of printed circuits, but the information sounded reliable. Actually, the suppliers of chemicals and technique have conveyed a more profound knowledge about the processes than the manufacturers. This is not surprising since the core business for the manufacturers of printed circuits include more than the actual manufacture.</p>
<p>Etching agent for compound semiconductors and ceramic filters</p>	<p><u>Japan</u>: Substitution is complete.</p> <p><u>Sweden</u>: From the suppliers of chemicals to the printed circuit manufacturers it is stated that no PFOS is sold. One of the suppliers claims that PFOS may be omitted by a smaller change in technique when the wafers are cleaned and another one states that PFOS-free desmear has been marketed before. This has not been verified by the manufacturers of printed circuits.</p>
<p>Aviation hydraulic fluids</p>	<p><u>Canada</u>: This use has been prohibited since 2016 as alternatives exist.</p> <p><u>Madagascar</u>: Hyjet IV A plus, ROYCO</p> <p><u>Netherlands</u>: Other fluorinated substances (PFAS) are used. After the survey by Royal HaskoningDHV (2013) four technical maintenance companies were approached as well as the Ministry of Defense and two main producers of Aviation hydraulic fluid (Royal Shell - Aeroshell and Eastman Chemicals Company, formerly Solutia – Skydroll). Both companies informed us that they do not use PFOS anymore in their aviation hydraulic fluids. The third main company, (Exxon Mobile - Hyjet), had already confirmed that for the German 2012 submission to Stockholm Convention.</p> <p><u>Spain</u>: Fluorinated phosphate esters</p> <p><u>Sweden</u>: With reference to an official document from one of the suppliers, dated 130522, PFOS has been phased out from phosphate esters based</p>

²⁷ Further information on the replacement of PFOS containing photo-resist within the semiconductor industry can be found in the following document: The World Semiconductor Council Joint Statement: http://www.semiconductorcouncil.org/wsc/uploads/WSC_2011_Joint_Statement.pdf See pp. 7, 16-20.

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	<p>hydraulic fluids. It has been replaced by other fluorinated compounds, PFAS. The phasing out of PFOS by this supplier has not been widely advertised, the customers in question have been informed separately. As far as can be tracked, the substitution of PFOS in this case occurred in 2012/beginning of 2013.</p> <p>The hydraulic fluids existed before PFOS was industrially available and the oil-based fluids might be an alternative.</p>
<p>Metal plating (hard metal plating) only in closed-loop systems</p>	<p><u>Australia</u>: Some users have switched to PFOS-free chemicals.</p> <p><u>Canada</u>: 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 RN 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 RN 29420-49-3. Domestically this use has been prohibited since 2016 pursuant to the <i>Prohibition of Certain Toxic Substances Regulations, 2012</i>. Some short chain PFASs have been identified as alternative substances.</p> <p><u>Czech Republic</u>: ANKOR Dyne 30 MS</p> <p><u>Finland</u>: Trade name: Proquel Z/A</p> <p><u>Netherlands</u>: PFOS still used. According to industry no alternatives are available yet. US-EPA is developing a process on the basis of Cr³⁺ which is not yet commercially available. This process does not utilize PFOS.</p> <p><u>Norway</u>: Hard metal plating in closed loop: 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</p> <p><u>Slovenia</u>: No data on alternatives.</p> <p><u>Sweden</u>: Partially fluorinated alternatives (fluorotelomers), have shown sufficient properties. The requirements of "closed loop systems" with regards to PFOS needs to be clarified - see comment below.</p> <p>Partially fluorinated alternatives (fluorotelomers), have shown sufficient properties. Experiments on both laboratory scale and pilot scale in a hard chrome plating shop were performed in Denmark and reported in 2012. The telomer is now used by two middle size hard chrome platers in Sweden. Two of the hard chrome platers use covering balls in combination with additional cover of the baths. With increased ventilation, they claim that the work environment is acceptable without mist suppressant agent.</p> <p>Two plating shops with several years of good experience of full scale plating with a fluorotelomer state that the costs are actually lower than with PFOS. The electroplaters still using PFOS are bigger on plating than the other ones. About 8 kg of the partially fluorinated alternative (fluorinated telomer) is estimated to have been purchased to substitute former use of PFOS. This chemical was introduced in 2009 by one supplier. Two hard chrome platers started test runs the same year and 2011 and the PFOS was totally replaced by this telomer. One of the small suppliers plans to introduce the same kind of mist suppressant agent soon - after having positive experiences from Finland.</p>
<p>Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters)</p>	<p><u>Japan</u>: Substitution is complete.</p> <p><u>Netherlands</u>: PFOS not used</p> <p><u>Spain</u>: PFOS-free filters. Alternatively, PFBS are tested as surfactant in coating products.</p>
<p>Fire-fighting foam</p>	<p><u>Australia</u>: Major users have switched to PFOS-free foams.</p> <p><u>Canada</u>: Domestically this use has been prohibited since 2009 pursuant to the PFOS Regulations. Since 2016, under the <i>Prohibition of Certain Toxic Substances Regulations, 2012</i>, 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</p>

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	<p>AFFF in which residual PFOS concentration is less than or equal to 10 ppm.</p> <p><u>Czech Republic</u>: AFFF (STHAMEX®) FFFP (SCHAUMGEIST®)</p> <p><u>Finland</u>: Fire-fighting foams have been replaced by other non-PFOS -AFFF by mid-2011; Most likely shorter chain fluorinated compounds. However, the chemical composition of alternatives is not known.</p> <p><u>Madagascar</u>: BIO fluoro Pro 6, PRFOLON 6, PROFILM6, Bio FLUOFOAM 6S, TUTOGENE A3F, PROFOAM, ANSULITE 3X3, UNISERAL AF 1612 SP3 AM</p> <p><u>Netherlands</u>: PFOS 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 for the various fires for which PFOS was used 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.</p> <p><u>New Zealand</u>: 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.</p> <p><u>Norway</u>: 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.</p> <p><u>Romania</u>: BIO HYDROPOL 6 containing 5-10% 2-(2-butoxyethoxy)ethanol (CAS 11234-5; EC 203-961-6)</p> <p>Physicochemical properties of 2-(2-butoxyethoxy)ethanol:</p> <ul style="list-style-type: none"> • Vap.pres. = 0.02 hPa at 26.9°C • Wat.sol.ct.= miscible at 20 °C • logPow = 0.15-0.4 <p>Quantities of use per year: 5729 kg BIO HYDROPOL 6 PROFOAM 806G containing 2-6% Hexylene glycol (CAS 107-41-5, EC 203489-0)</p> <ul style="list-style-type: none"> • hydrolyzed protein [70-80%], • metallic salt: NaCl+MgCl2 [8-15%]; FeSO4*7H2O[0-2%] <p>Physicochemical properties of Hexylene glycol:</p> <ul style="list-style-type: none"> • Vap.pres. = 0.07 hPa at 26.9°C • Wat.sol.ct.= Miscible with water in all properties • logPow < 0.14 at 25 °C <p>Quantities of use per year: 15799 kg PROFOAM 806G</p> <p><u>Spain</u>: 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.</p> <p><u>Sweden</u>: Import of PFOS-containing fire-fighting foam ended in 2003. A survey of the chemical content of relevant FFFs on the market is ongoing.</p> <p><u>Switzerland</u>: Partly fluorinated chemicals</p> <p><u>United Kingdom</u>: Telomer and fluorine-free alternatives</p>

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
<p>Insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i></p>	<p>Brazil: 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 <i>Atta spp.</i> and <i>Acromyrmex spp.</i> 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.</p> <p>There are basic studies being developed in research centers 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 (Boaretto 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.</p> <p>Guyana: Use of Fipronil and other pyrethroids as alternative.</p> <p>Trinidad & Tobago: Development of a citrus peel bait by a local company using Fipronil as the active ingredient.</p>
<p>Photo masks in the semiconductor and liquid crystal display (LCD) industries</p>	<p>Spain: Digital techniques. Telomer-based products of various perfluoroalkyl chain length. C3- and C4-perfluorinated compounds. Hydrocarbon surfactants. Silicone products.</p>
<p>Metal plating (hard metal plating)</p>	<p>Australia: Some users have switched to PFOS-free chemicals.</p> <p>Austria: Switch to substitutes</p> <p>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. Domestically this use has been prohibited since 2016 pursuant to the <i>Prohibition of Certain Toxic Substances Regulations, 2012</i>. Some short chain PFASs have been identified as alternative substances. 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 RN 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 RN 29420-49-3.</p> <p>Finland: Trade name: Proquel Z/A</p> <p>Germany: The German Federal Environment Agency commissioned a research report on alternatives to PFOS in the metal plating industry (hard metal plating, decorative plating). In the metal plating industry, PFOS can either be substituted by H4PFOS (CAS No.: 276-19-97-2), or with non-fluorinated tensides, the basic elements of which are alkylsulfonates (CH₃(CH₂)_nSO₃H). H4PFOS is not considered a suitable substitution chemical for PFOS by Germany, given its persistence and estimated substance characteristics, which are similar to PFOS. Alkylsulfonates are commonly used, degradable surfactants. TIB Chemicals has filed a patent and has declared the exact formulation as confidential business information, thus our information refers to the general group of alkylsulfonates. According to the progress report mentioned above, the substitution of PFOS in the metal plating industry with non-fluorinated surfactants is feasible for both bright chrome plating and hard chrome plating.</p> <p>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.²⁸</p>

²⁸ Information is available at: <http://www.cleaner-production.de/projekte-publikationen/projekte/galvanotechnik/einsatz-cr6-freier-elektrolyte-zur-verchromung-von-hochwertigen-automobil-komponenten.html>; <http://www.cleaner-production.de/projekte-publikationen/projekte/galvanotechnik/umruestung-einer-galvanik-auf-umweltfreundliche-beize.html>;

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
	<p><u>Romania</u>: VpCl - 414 containing 2-6% 2- Amino-ethanol (CAS 141-43-5; EC 205-483-3) Physicochemical properties for 2- Amino-ethanol - Vap.pres. = 0.58 hPa at 26.9°C - Wat.sol.ct.= miscible at 20 °C - logPow = - 1.91 at 25 °C - air photodegradation :50% after 26.6 hours Quantities of use per year: 56 kg VpCl – 414</p> <p><u>Singapore</u>: Use of chemical alternative</p> <p><u>Spain</u>: Methods: suction equipment, plastic balls and surfactants; chemical products that reduce the size of the bubbles during chroming, so that they rise at a lower speed, do not form a foam layer and are chemically stable.</p> <p><u>Sweden</u>: see information provided on metal plating in closed-loop systems.</p>
Metal plating (decorative plating)	<p><u>Australia</u>: Some users have switched to PFOS-free chemicals.</p> <p><u>Austria</u>: Switch to substitutes</p> <p><u>Canada</u>: 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. Domestically this use has been prohibited since 2016 pursuant to the <i>Prohibition of Certain Toxic Substances Regulations, 2012</i>. Some short chain PFASs have been identified as alternative substances. 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 RN 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 RN 29420-49-3.</p> <p><u>Germany</u>: See comment in hard metal plating above.</p> <p><u>Spain</u>: Use of trivalent chromium, in which case it is not necessary to use a mist catcher.</p> <p><u>Sweden</u>: In decorative chrome electroplating the chromium layer is a few µm in contrast to the about 35 µm in hard chrome. This enables a somewhat milder electroplating where Cr³⁺ is used instead of Cr⁶⁺ and consequently the aerosols are not as hazardous. By the use of Cr³⁺ the demisting foam may be omitted and thereby the need for PFOS. With the thinner chrome layer, the intensity of the process is also less which enables other means of surface cover than foam. Plastic balls are one example that may be used in decorative electroplating.</p>
Electric and electronic parts for some colour printers and colour copy machines	<p><u>Netherlands</u>: PFOS not used.</p> <p><u>Spain</u>: Environmentally sound product design.</p>
Insecticides for control of red imported fire ants and termites	<p><u>Trinidad & Tobago</u>: Fipronil baits as well as imidachloprid drenches for termite control.</p>
Chemically driven oil production	<p><u>Netherlands</u>: PFOS not used.</p> <p><u>Spain</u>: perfluorobutane sulfonate (PFBS), telomer based fluorosurfactants and other perfluoro compounds for uses in oil recovery such as perfluoroalkyl-substituted amines, acids, amino acids and thioether acids.</p>
Carpets	<p><u>Netherlands</u>: PFOS not used.</p> <p><u>Sweden</u>: In most domestic houses stain repellent carpets are not common.</p>
Leather and apparel	<p><u>Netherlands</u>: PFOS not used.</p>
Textiles and upholstery	<p><u>Madagascar</u>: Olephobol C</p> <p><u>Netherlands</u>: PFOS not used.</p> <p><u>Spain</u>: perfluorobutane sulfonate (PFBS) based substances, fluorotelomer-based substances, silicone based or other fluorinated copolymers.</p>

http://www.cleaner-production.de/fileadmin/assets/pdfs/Abschlussberichte/20_441_2_4_-_Implementierung_eines_neuen_Kunststoffmetallisierungsverfahrens.pdf;

http://www.bubw.de/PDF_Dateien/Downloadbereich/Downloads_2011/Abschlussbericht_PFOS.pdf

Use	Information on actions taken to phase out the use of PFOS, its salts and PFOSF and alternative substances or methods introduced
Paper and packaging	<p><u>Finland</u>: Grease-proof papers and boards can be formed chemically (acid treatment) or mechanically (refine the pulp for a long time at a low temperature). In addition to these methods greaseproof paper can be made using a variety of surface treatment. There are several different surface treatments of normal coating, waxing to laminating.</p> <p><u>Netherlands</u>: PFOS not used.</p> <p><u>Spain</u>: Fluorinated products with 1 – 1.5% of fluorochemical. N-Methyl perfluorooctane sulfonamidoethanol acrylate polymers or short chain telomere-based substances.</p>
Coatings and coating additive	<u>Netherlands</u> : PFOS not used.
Rubber and plastics	<u>Netherlands</u> : PFOS not used.
Other uses	<u>Netherlands</u> : PFOS not used.

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

29. 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.

30. Table 9 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 call for information in 2018.

Table 9: 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)

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
Austria	Austria is participating in the EU review.
Belgium	Belgium reports that the country's specific exemption (hard metal plating and decorative plating) does not need to be extended after 2015
Brazil	<p>Metal Plating: Brazil ceased the use of PFOS for metal plating in 2017.</p> <p>Brazil has reviewed the need for the acceptable purpose of PFOSF as an intermediate in the production of sulfluramid to produce insect baits for control of leaf-cutting ants from <i>Atta</i> spp. and <i>Acromyrmex</i> spp. 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 <i>Atta</i> and <i>Acromyrmex</i> 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 <i>Atta</i> spp and <i>Acromyrmex</i> 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.</p> <p>The leaf-cutting ants of the genus <i>Atta</i> spp. and <i>Acromyrmex</i> 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, reforestation, etc.</p> <p>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.</p> <p>Currently, the active ingredients registered in Brazil for ant baits are sulfluramid, fipronil and chlorpyrifos. Chlorpyrifos 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.²⁹</p> <p>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 <i>Atta</i> spp. and <i>Acromyrmex</i> spp. as an acceptable purpose.</p>
Bulgaria	No use of PFOS in articles is identified, thus no need for specific exemptions and acceptable purposes are needed by Bulgaria.

²⁹ Britto, J. S.; Forti, L. C.; Oliveira, M. A.; Zanetti, R.; Wilcken, C. F.; Zanoncio, 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).

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
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 has prohibited all specific exemptions and many of the acceptable purposes. Since 2008, PFOS has been restricted in Canada through the <i>Perfluorooctane Sulfonate and its Salts and Other Compounds Regulations</i> , with a limited number of exemptions. In 2016, PFOS was added to the <i>Prohibition of Certain Toxic Substances Regulations, 2012</i> . These regulations include more limited exemptions than the previous regulations. Therefore, Canada no longer requires the specific exemptions for Photo masks in the semiconductor and liquid crystal display (LCD) industries, Metal plating (hard metal plating), and Metal plating (decorative plating). This conclusion was based on consultations with stakeholders which have indicated that the activities associated with these exemptions no longer occur in Canada.
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: (a) Prepare and keep updated the national inventory of POPs for industrial use; and (b) 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 purposes: Photo-imaging, Photo-resist and anti-reflective coatings for semi-conductors and Aviation hydraulic fluids. The Czech Republic will withdraw these uses from the 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 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. In Denmark, there is a continued need for the acceptable purpose "Metal plating (hard metal plating) only in closed-loop systems". The other acceptable purposes are not performed in Denmark.
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	Germany reports that the specific exemption for PFOS in the EU (hard metal plating and decorative plating) will expire in May 2015. The EU and its member States including Germany will not apply for an extension of the exemption. The acceptable purposes for PFOS in the EU will prevail.
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	Plans to cancel specific exemptions in domestic laws in April 2018 because substitution is completed for the use of photo-imaging, photo-resistant, anti-reflective coatings for semi-conductors, etching agent for compound semi-conductors and ceramic filters, and certain medical devices which are registered as acceptable purposes.
Myanmar	Myanmar uses Tributyl Phosphate (SKYDROL LD-4/500B-4) as a hydraulic fluid

Party	Progress made to eliminate PFOS, its salts and PFOSF and the continued need for specific exemptions and/or acceptable purposes
Netherlands	The Inventory on the use of PFOS in the Netherlands ³⁰ 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	<p>Norway reports that there is no continued need for the specific exemption "Photo-masks in the semiconductor and liquid crystal display (LCD) industries". As for the acceptable purposes:</p> <p>(a) Aviation hydraulic fluids: there is continued need for this application;</p> <p>(b) Metal plating (hard metal plating) only in closed-loop systems: the current use of PFOS in this application is low but there is a continued need.</p> <p>Information was not available in Norway for the present use for the remaining acceptable purposes:</p> <p>(a) Photo-imaging;</p> <p>(b) Photo-resist and anti-reflective coatings for semi-conductors;</p> <p>(c) Etching agent for compound semi-conductors and ceramic filters.</p> <p>Norway is currently registered for the following acceptable purposes:</p> <p>(a) Photo imaging;</p> <p>(b) Photo resist and anti-reflective coating for semi-conductors;</p> <p>(c) Etching agent for compound semiconductors and ceramic filters;</p> <p>(d) Hard metal plating in closed loop.</p> <p>However, we are continuously working to phase out the remaining uses</p>
Poland	<p>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:</p> <p>(a) Photo-imaging;</p> <p>(b) Photo-resist and anti-reflective coatings for semi-conductors;</p> <p>(c) Etching agent for compound semi-conductors and ceramic filters;</p> <p>(d) Aviation hydraulic fluids (withdrawn on 09/06/2017);</p> <p>(e) Metal plating (hard metal plating) only in closed-loop systems.</p> <p>The EU restriction is not limited to PFOS, its salts and PFOSF but covers all PFOS derivatives defined as C8F17SO2X where X= OH, metal salt (O-M+), halide, amide, and other derivatives including polymers.</p> <p>The fire-fighting foams that were placed on the EU market before 27 December 2006 could be used till 27 June 2011.</p>
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.
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.
Sweden	<p>Sweden reports on the results of a 2013 study made in the areas exempted from the EU ban, as follows:</p> <p>(a) Wetting agents for use in controlled electroplating systems;</p> <p>(b) Photo-resists or anti reflective coatings for photolithography processes;</p>

³⁰ RHDHV 2013. Inventory on the use of PFOS in the Netherlands. 9 July 2013.

Party	Progress made to eliminate PFOS, its salts and PFOSE and the continued need for specific exemptions and/or acceptable purposes
	<p>(c) Photographic coatings applied to films, papers or plates;</p> <p>(d) Mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems;</p> <p>(e) Hydraulic fluids for aviation.</p> <p>Further to this study, PFOS is phased out in (ii). In (iii) the consumption is reduced to a few grams due to the fact that these techniques are replaced by digital technique. In (iv) and (i) the annual consumption has been rather constant, but a phase out has been achieved by some smaller companies by polyfluorinated alternatives and other means of mist suppressing. Based on non-existing information about PFOS in the MSDS (v) the content should be less than 1%. The estimated amount of PFOS used annually in Sweden before 2012 was 10 kg. From 2013 the amount is estimated to be <1 kg as other PFAS, that could be of similar concern, have been phased in.</p>
Switzerland	<p>The specific exemptions for Metal plating (hard metal plating) and Metal plating (decorative plating) are no longer needed.</p>
United Kingdom	<p>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. The UK government has undertaken the following outreach to promote the elimination of PFOS, its salts and PFOSE:</p> <p>Communications</p> <p>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 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.</p> <p>Briefings</p> <p>A briefing note about the required phase-out and necessary actions was circulated:</p> <ul style="list-style-type: none"> (a) Sent directly to permitted sites via their Environment Agency inspector; (b) Uploaded to the Communities of Practice forum for Pollution Prevention Control staff at local authorities; (c) Shared with Health Safety Executive's (HSE's) COMAH (Control of Major Accident Hazards) business support unit; (d) Emailed to a number of relevant trade associations for onward cascade to their members; (e) Sent for inclusion in the Energy Institute's revised Code of Practice; (f) Uploaded to the PFOS webpage on the Environment Agency's external website; (g) Other external communications. <p>Three articles were published in relevant trade journals.</p> <ul style="list-style-type: none"> (a) Article and later update published in JOIFF's month publication – The Catalyst magazine (January 2011, follow-up in July 2011); (b) Feature article (interview) published in the Industrial Fire Journal (IFJ Q3, 2011); (c) A presentation was also delivered to the Humber Chemical Forum (Fire & Security Group) meeting. <p>Outcomes</p> <p>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.</p>

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

31. One of the information listed in paragraph 5 of Part III of Annex B to the Convention as 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 through the call for information in 2018. Article 15 national reports has a question related to the promotion of research and development of safer alternatives.
32. According to the responses to the call for information in 2018 and national reports (4th Cycle) countries mention their support to the POPRC, the Expert Working Group on BAT/BEP, OECD/UNEP Global Perfluorinated Chemicals (PFC) Group, funding provided to the GEF or bilateral project initiatives, the development of resources on alternatives, and information sessions to delegates from other countries.
33. Several countries mention efforts to develop alternatives, most of these initiatives being within industry. Some countries 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.
34. 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.
35. 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.

IX. Sulfluramid

A. Background

36. Annex B to the Convention lists PFOS, its salts and PFOSF. PFOS-related chemicals are chemicals that contain the structural element PFOS in their molecular structure and are or were produced with PFOSF as starting or intermediate material. Sulfluramid (N-Ethyl perfluorooctane sulfonamide; EtFOSA; CAS registry number 4151-50-2) is produced from PFOSF, however its name or CAS number is not included in Annex B to the Convention.

37. 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.³¹

38. Insecticides for control of red imported fire ants (RIFA) and termites are listed as specific exemptions or the production and use of PFOS, its salts and PFOSF in Annex B. China is the only country that has registered a specific exemption for this use. It has indicated that with regard to the specific exemptions, efforts would be made to develop substitutes as soon as possible in order to eliminate the need for all of exemptions before they expire.

39. The Secretariat has received notifications for acceptable purposes from Brazil and Vietnam 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 call for information in 2018, other countries may still be using sulfluramid: Argentina, Benin, Belize, Brazil, Colombia, Costa Rica, Honduras, Mexico, Paraguay, and Trinidad & 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. In recent years, Brazil had also exported to Peru, Suriname, and Uruguay.

40. In 2016 the Committee developed the consolidated guidance on alternatives to PFOS and its related chemicals (UNEP/POPS/POPRC.12/INF/15/Rev.1). 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 as insect baits is no longer used in Brazil 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.

B. Production, use, import and export of sulfluramid

41. 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), and 35, 090 kg (2017). Information on production of sulfluramid in other countries was not found.

42. Three 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),³² 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), and Trinidad and Tobago (Before 2009: 50 kg; 2009: 50 kg; 2010: 50, kg).

43. Table 10 provides a summary of information on use, import and export of sulfluramid provided by Parties in the national reports, national implementation plans and response to the call for information in 2018.

³¹ Stockholm Convention on Persistent Organic Pollutants Persistent Organic Pollutants Review Committee (2007) Risk management evaluation on perfluorooctane sulfonate. UNEP/POPS/POPRC.3/20/Add.5; Stockholm Convention on Persistent Organic Pollutants Persistent Organic Pollutants Review Committee (2018) Further assessment of information on pentadecafluorooctanoic acid (CAS No: 335-67-1, PFOA, perfluorooctanoic acid), its salts and PFOA-related compounds. UNEP/POPS/POPRC.14/3.

³² While this amount was provided in the national report (4th cycle) of Bosnia & 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/>).

44. While information on production, import, export, and use is limited, what is available indicates that sulfluramid is still widely used in Latin America, and could also be used in other countries, which have not registered either a specific exemption for Control of red imported fire ants (RIFA) and termites or an acceptable purpose for Insect baits for control of leaf-cutting ants from *Atta spp.* and *Acromyrmex spp.*

Table 10: 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	
Bosnia & Herzegovina	Reported estimated use of 56,000 kg PFOS for insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i> in 2012 ³³		
Brazil	2013: 27,165 2014: 28,694 2015: 28,069 2016: 33,701 2017: 33,186		2013: 1,472.67 2014: 1,884.45 2015: 1,473 2016: 2,038.83 2017: 1,844.76
Colombia		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.	
Honduras		NIP (2015 update) indicates that from 2009 to 2013 a total of 140,387.5 kg was imported.	
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.	
Trinidad & Tobago	Trinidad & Tobago reported the following estimates of use: 50 kg (Before 2009), 50 kg (2009) and		

³³ See note above.

Party	Use (kg)	Import (kg)	Export (kg)
	50kg (2010) as Insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i>		

C. Local monitoring of releases of PFOS from the use of sulfluramid

45. In its response to the call for information in 2018, Brazil indicated that while there is some information on the presence of PFOS detected in aquatic biota and waters on the Brazilian coast given the use of PFOS in a variety of applications, it is not possible to determine the source of this contamination. Information on the transformation of sulfluramid into PFOS in soils is scarce; no information is available for soils in Brazil or tropical environments. In addition, data on the occurrence of PFOS and its distribution in different environmental compartments associated with the agricultural use of sulfluramid is scarce. While degradation studies have been conducted using the active ingredient, there is the lack of studies that have examined the degradation of baits containing sulfluramid in natural or comparable settings. Therefore, Brazil believes there is insufficient evidence to conclude that such baits result in environmental releases of PFOS.

46. The submission by Brazil and Leaf-Cutting Ant Baits Industries Association (ABRAISCA) indicate that while there are numerous studies reporting the occurrence of PFCs in the environment, wildlife and humans, knowledge and understanding of the routes by which these contaminants enter the environment, and their fate and transport once in the environment, are still very limited. Given the numerous potential sources of PFCs including PFOS into the environment, it is not possible to attribute the origins of environmental residues specifically to the application of sulfluramid. The Draft addendum to the risk management evaluation on PFOA, its salts and PFOA-related compounds (UNEP/POPS/POPRC.14/3) discusses the potential for sulfluramid to degrade into PFOS.

47. The Stockholm Convention Regional Center in Brazil is developing a cooperation agreement with the Brazilian Agricultural Research Corporation (Embrapa) to perform laboratory biodegradation tests for sulfluramid. The aim of this study is to verify whether or not PFOS is a degradation product of sulfluramid in representative soils of reforestation areas. ABRAISCA is collaborating with Professors Doctors Robson Pitelli and Luiz Carlos Forti of the Universidade Estadual Paulista on a project "Assessment of the behavior and degradation of sulfluramid, applied in the form of ant bait for the control of leaf-cutting ants, in Brazilian soils." The project will be carried out in stages. The first stage includes a study of degradation with the baits in the laboratory, using clay and sandy soils collected from a eucalyptus growing area. If the results show that baits with sulfluramid do not degrade into PFOS, the project will end; otherwise the project will continue with laboratory and field studies using biota (for example, ants and fungus).

X. Conclusions

48. 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 the call 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.
49. As of August 2018, only 64 of 174 Parties have submitted their national implementation plans reflecting PFOS, its salts and PFOSF. A large majority of Parties are still in the process of updating their national implementation plans through which initial information on the national situation may be obtained.
50. As of 31 August 2018, the number of Parties that have submitted their third and fourth national reports are 93 and 35, respectively. The low submission rate of national reports is another critical factor of data limitation.
51. 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.
52. 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.
53. 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; however, production in China has increased substantially since 2001. Stricter legislation and control worldwide are expected to reduce 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.
54. 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 the photo-imaging sector, photographic films continue to disappear, and the present use is practically limited to special products. Further, new techniques have been developed which do not require PFOS in photolithographic procedures;
 - (b) In photo-resist and anti-reflective coatings for semi-conductors, PFOS free technology has been reported, however, for reasons of confidential business information, the alternate photo-resist chemistry could not be disclosed. Replacement of PFOS has been achieved through a variety of means including the use of shorter-chain compounds (C-4 to C-1 carbon chains), the use of non-fluorinated substitutes and the elimination of the surfactant function within the photo-resist. Information from other Parties points to the industry, together with suppliers, working on PFOS-free solutions, however industry asserts that more time is needed to develop a full range of qualitatively comparable alternatives;
 - (c) The use of PFOS in aviation hydraulic fluids seems to be outdated. It has been replaced by other fluorinated compounds;
 - (d) 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, according to users, not all processes are suitable for the use of PFOS-free mist suppressants/wetting agents. 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- Perfluorooctane sulfonic Acid, CAS RN 27619-97-2). Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3. Partially fluorinated alternatives (fluorotelomers) are considered to have shown sufficient properties;
 - (e) 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 fluoro compounds can damage the environment;
 - (f) There are basic studies being developed in research centres and universities evaluating biological and natural products such as plant extracts for the control of leaf-cutting ants. The results, however, have been inconsistent, demonstrating technical, economic and operational infeasibility;

(g) For metal plating (hard metal and decorative plating), some Parties report users having switched to PFOS-free chemicals. 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- Perfluorooctane sulfonic Acid, CAS RN 27619-97-2). Another alternative substance that has been identified for use is perfluorobutane sulfonate, CAS RN 29420-49-3, however H4PFOS is not considered a suitable substitution chemical for PFOS by some Parties, given its persistence and estimated substance characteristics, which are similar to PFOS. Alkylsulfonates are commonly used, degradable surfactants. The exact formulation is confidential business information, but the substitution of PFOS in the metal plating industry with non-fluorinated surfactants seems feasible for both bright chrome plating and hard chrome plating. In decorative plating, through the use of Cr³⁺ instead of Cr⁶⁺, the demisting foam may be omitted and thereby the need for PFOS. Plastic balls are one example that may be used in decorative electroplating. Several Parties report that an extension of the specific exemption for metal plating (hard metal and decorative plating) will not be required in their case.

55. 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.

56. While sulfluramid is not specifically referred to in Annex B to the Convention, PFOS, its salts and PFOSF are chemicals that contain the structural element PFOS in their molecular structure and are or were produced with PFOSF as starting or intermediate material. Sulfluramid is produced from PFOSF. In addition, data indicates that PFOS can be one of the degradation products of sulfluramid, which means its use may represent a direct release of PFOS to the environment (UNEP/POPS/POPRC.3/20/Add.5; UNEP/POPS/POPRC.14/3).

57. Two PFOS uses found in Annex B are relevant: the specific exemption “insecticides for control of red imported fire ants (RIFA) and termites”, and the acceptable purpose “insect baits for control of leaf-cutting ants from *Atta spp.* and *Acromyrmex spp.*” China registered for a specific exemption for the control of fire ants and termites, and Brazil and Vietnam registered for the acceptable purpose for the control of leaf-cutting ants. However, information available suggests that sulfluramid is still widely used in Latin America, and could also be used in other countries, which have not yet registered these uses with the Secretariat.

58. In order to correctly reflect the situation of use of PFOS, its salts and PFOSF for the purpose 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.

59. While there is limited data, Gilljam and colleagues (2016) concluded that the agricultural use of sulfluramid in Latin America could be an important source of PFOS into the environment.³⁴ 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.³⁵ 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 ground-water.³⁶ It is important to continue monitoring the presence of sulfluramid and PFOS in the environment.

³⁴ Löfstedt Gilljam, John; Leonel, Juliana; Cousins, Ian T. and Benskin, Jonathan P. 2016. Is Ongoing Sulfluramid Use in South America a Significant Source of Perfluorooctanesulfonate (PFOS)? Production Inventories, Environmental Fate, and Local Occurrence. *Environ. Sci. Technol.*, 2016, 50 (2), pp 653-659. DOI: 10.1021/acs.est.5b04544

Löfstedt Gilljam, John; Leonel, Juliana; Cousins, Ian T. and Benskin, Jonathan P. 2016. Additions and Correction to Is Ongoing Sulfluramid Use in South America a Significant Source of Perfluorooctanesulfonate (PFOS)? Production Inventories, Environmental Fate, and Local Occurrence. *Environ. Sci. Technol.*, 2016, 50 (14), pp 7930-7933. DOI: 10.1021/acs.est.6b02351

³⁵ Zabaleta, Itsaso; Bizkarguenaga, Ekhine; Nunoo, Deborah B. O. Schultes, Lara; Leonel, Juliana; Prieto, Ailette; Zuloaga, Olatz and Benskin, Jonathan P. 2018. Biodegradation and Uptake of the Pesticide Sulfluramid in a Soil-Carrot Mesocosm. *Environ. Sci. Technol.*, 2018, 52(5) pp. 2603-2611. DOI: 10.1021/acs.est.7b03876

³⁶ Nascimento, Rodrigo A.; Nunoo, Deborah B.O.; Bizkarguenaga, Ekhine; Schultes, Lara; Zabaleta, Itsaso; Benskin, Jonathan P.; Span, Saulo and Leonel, Juliana. 2018. Sulfluramid use in Brazilian agriculture: A source of per- and polyfluoroalkyl substances (PFASs) to the environment. *Environmental Pollution* 242 (2018): 1436-1443.

References

- Carloni D. 2009. Perfluorooctane Sulfonate (PFOS) Production and Use: Past and Current Evidence. Report prepared for UNIDO. December 2009.
https://www.unido.org/fileadmin/user_media/Services/Environmental_Management/Stockholm_Convention/POPs/DC_Perfluorooctane%20Sulfonate%20Report.PDF
- Environment Canada, Chemicals Management Division. 2013. Update to Canada's National Implementation Plan under the Stockholm Convention on Persistent Organic Pollutants. April 2013.
<https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=E0F02793-1>
- Environment Canada. Health Canada. 2013. Consultation Document. Perfluorooctane Sulfonate, its Salts and Certain Other Compounds Regulations – Examination of On-going Exemptions. January 2013. <https://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=96A225B1-1>
- European Commission - Commission Regulation EC 1907/2006 (REACH) and amendments.
http://ec.europa.eu/enterprise/sectors/chemicals/reach/restrictions/index_en.htm
- ESWI Consortium (Expert Team to Support Waste Implementation) 2011. Study on waste related issues of newly listed POPs and candidate POPs. Service request under the framework contract No ENV.G.4/FRA/2007/0066. Draft final report. 13 April 2011.
- Federal Office for the Environment (FOEN). 2012. Switzerland's first update of the National Implementation Plan under the Stockholm Convention. 22 August 2012.
<http://chm.pops.int/Implementation/NIPs/NIPSubmissions/tabid/253/Default.aspx>
- Japan. 2012. The National Implementation Plan of Japan under the Stockholm Convention on Persistent Organic Pollutants. August 2012.
<http://chm.pops.int/Implementation/NIPs/NIPSubmissions/tabid/253/Default.aspx>
- Royal HaskoningDHV (RHDHV) 2013. Inventory on the use of PFOS in the Netherlands. Report prepared for the Ministry of Infrastructure and Environment of the Netherlands. 9 July 2013.
<http://chm.pops.int/Convention/POPsReviewCommittee/LatestMeeting/POPRC8/POPRC8Followup/SubmissionBDEsPFOS/tabid/3064/Default.aspx>
- Stockholm Convention:
<http://chm.pops.int/Countries/Reporting/NationalReports/tabid/3668/Default.aspx>;
<http://chm.pops.int/Implementation/NIPs/NIPSubmissions/tabid/253/Default.aspx>;
<http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC7/POPRC7Followup/InformationonBDEsandPFOS/tabid/2542/Default.aspx>;
<http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC9/POPRC9Followup/PFOSSubmission/tabid/3565/Default.aspx>
- UNECE 2006. Overview of Existing Information on PFOS Production, Use, Emissions and Pathways to the Environment and Cost/Benefits with alternatives/substitutes.
<http://www.unece.org/fileadmin/DAM/env/lrtap/TaskForce/popsxg/2006/Overview%20of%20existing%20information%20on%20PFOS%20emissions%20and%20pat..pdf>
- UNEP-POPS-POPRC9FU-SUBM-PFOS-Fluorocouncil-3-20140131.En available at
<http://chm.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC9/POPRC9Followup/PFOSSubmission/tabid/3565/Default.aspx>
- Varón, Edgar H., Sanford D. Eigenbrode, Nilsa A. Bosque-Pérez and Luko Hilje. 2007. Effect of farm diversity on harvesting of coffee leaves by the leaf-cutting ant *Atta cephalotes*. *Agricultural and Forest Entomology* (2007), 9, 47–55.