ROYAL NORWEGIAN MINISTRY OF
CLIMATE AND ENVIRONMENT

NORWEGIAN IMPLEMENTATION PLAN FOR

THE STOCKHOLM CONVENTION ON

PERSISTENT ORGANIC POLLUTANTS (POPs)

Norway's implementation plan for the Stockholm Convention was drawn up by the Norwegian Environment Agency, which is the government agency reponsible for chemicals and pollution prevention. The plan has been approved by the Ministry of Climate and Environment.

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SAMMENDRAG

Persistente organiske miljøgifter (POP-er) er organiske stoffer som er lite nedbrytbare og som blir værende i miljøet i lang tid. De oppkonsentreres i dyr og kan forårsake skadelige effekter på menneskers helse og på miljøet. De kan transporteres over lange avstander med havstrømmer og i atmosfæren. Norges beliggenhet gjør at vi får tilført betydelige menger miljøgifter via slik langtransport. Dette er særlig tilfelle i Arktis, der forhøyede nivåer av POP-er gir grunn til bekymring. Fordi POP-ene kan transporteres over store geografiske avstander, er globale tiltak nødvendig for å stanse tilførslene og for å hindre skade på helse- og miljø.

Stockholmkonvensjonen og dens forpliktelser

Stockholmkonvensjonen har som formål å beskytte menneskers helse og miljøet mot POP-er. Konvensjonen trådte i kraft 17. mai 2004. Land som er parter til avtalen plikter å iverksette tiltak for å eliminere eller redusere produksjon, bruk og utslipp av POP-er. Norge ratifiserte Stockholmkonvensjonen 11. juli 2002.

Artikkel 7 i konvensjonen krever at hver part utvikler en nasjonal implementeringsplan (NIP) som viser hvordan forpliktelsene i konvensjonen gjennomføres. NIP-en skal gjennomgås og oppdateres med jevne mellomrom, når nye stoffer listes i konvensjonen og/ eller det blir gjort vedtak som endrer partenes forpliktelser. NIP-en beskriver regelverk og andre tiltak for å redusere eller stanse bruken av POP-er, utslipp fra lagre av POP-er og fra avfall, miljøovervåkning og forskning, og teknisk og finansiell bistand til andre land. Tiltak Norge har gjort er beskrevet i mer detalj i tidligere NIP-er.

De norske NIP-ene

Hovedfokuset for denne NIP-en er de POP-ene som ble inkludert i konvensjonen i 2017 (decaBDE, SCCP) og i 2019 (dikofol og PFOA), samt endringene i listingen for HCBD og PFOS som ble vedtatt på partsmøtene i 2017 og 2019.

Den første norske NIP-en ble ferdigstilt i 2006, to år etter ikrafttredelsen av avtalen. Den første NIP-en omtaler tiltakt rettet mot de 12 første POP-ene som ble listet i konvensjonen. Etter dette har NIP-en blitt oppdatert tre ganger. Norge jobber fortsatt med å stanse og

begrense bruken av nyere POP-er. Flere av disse stoffene er listet med unntak for visse bruksområder. Tabellen nedenfor viser hvilke oppdateringer som er gjort siden den første NIP-en ble sendt inn i 2006.

Tabell 1. Oversikt over de norske NIP-ene

NIP nr	Dato for innsendelse	Innhold
1	22.06.2006	De 12 opprinnelige POP-ene aldrin, klordan, DDT, dieldrin, endrin, heptaklor, mirex, toksafen, polyklorerte bifenyler (PCB), dioksiner og furaner (PCDD/PCDF) og heksaklorbenzen (HCB)
2	22.01.2013	Dekker beslutninger fra det fjerde og femte partsmøtet om å liste klordekon, heksabrombifenyl , teknisk endosulfan og tilhørende isomerer, pentaklorbenzen (PeCB), alfa-heksaklorsykloheksan (α-HCH), beta-heksaklorsykloheksan (β-HCH), og lindan (gamma heksaklorsykloheksan; γ-HCH), og industri kjemikaliene; tetra-bromdifenyl- og penta-bromdifenyl eter (penta-BDE), heksabromdifenyleter, heptabromdifenyleter (okta-BDE), perfluoroktan sulfonsyre, dens salter og perfluoroktan sulfonyl fluorid (heretter kalt PFOS)
3	22.01.2017	Dekker beslutningene fra det sjette og syvende partsmøtet om listing av heksabromsyklododekan (HBCDD) fra partsmøtet i 2013, og polyklorerte naftalener (PCN), heksaklorbutadien (HCBD) og pentaklorfenol (PCP) fra partsmøtet i 2015.
4	28.06.2021	Denne NIP oppdateringen dekker beslutninger fra det åttende og niende partsmøtet. I 2017 ble dekabromdifenyleter (dekaBDE), kortkjedete klorparafiner (SCCP) og HCBD listet. I 2019 ble dicofol, PFOA, dets salter og PFOA-relatere forbindelser listet, samt at PFOS listingen ble oppdatert.

Norges arbeid med Stockholmkonvensjonen

Norge har ambisiøse nasjonale mål for helse- og miljøfarlige stoffer og skal være en sentral aktør i arbeidet for å fase ut helse- og miljøfarlige stoffer i EU og globalt. Arbeidet med Stockholmkonvensjonen er høyt prioritert, og Norge jobber aktivt både nasjonalt og i internasjonale fora for å begrense produksjon og bruk av POP-er for å hindre skade på menneskers helse og/ eller miljøet. Gjennom den statlige miljøovervåkningen i Norge overvåker vi nivåer og trender av POP-er i norsk miljø, og fremskaffer informasjon om nye miljøgifter. Miljøovervåkingen gir oss kunnskap til å sette i gang tiltak for å vedlikeholde eller forebygge forringelse av miljøverdier.

Norge har hittil foreslått globalt forbud mot fem stoffer gjennom Stockholmkonvensjonen. Penta-BDE ble nominert i 2005, HBCD i 2008 og dekaBDE i 2013. Disse bromerte flammehemmerne tatt inn i konvensjonen i henholdsvis 2009, 2013 og 2017. I 2017 nominerte Norge den perfluorerte forbindelsen PFHxS, dets salter og relaterte forbindelser. Listingen av PFHxS vil bli diskutert på det tiende partsmøtet i 2022, som på grunn av COVID-19 pandemien er utsatt ett år. Det siste stoffet Dekloran pluss, som er en klorert flammehemmer, ble nominert i 2019. Det faglige arbeidet med å vurdere om Dekloran pluss er en POP pågår fortsatt. Norge har vært ansvarlige for å sammenstille kunnskapsgrunnlaget for alle de fem stoffene Norge har nominert og bidrar inn i det faglige arbeidet under konvensjonen med norske forskningsresultater og miljøovervåkningsdata.

Norsk regelverk

Norsk miljølovgivning gir det nødvendige juridiske grunnlaget for at Norge kan oppfylle kravene i Stockholmkonvensjonen. I Norge er produksjon og bruk av POP-er forbudt eller strengt regulert.

Gjennom EØS-avtalen har Norge og EU samme miljøregelverk. Norge oppfyller forpliktelsene i Stockholmkonvensjonen og POP-protokollen i Konvensjonen om langtransportert, grenseoverskridende luftforurensning (LRTAP) gjennom POP-forordningen (EU) No 2019/1021, som er gjennomført i kapittel 4 i produktforskriften. I tillegg er andre forskrifter og reguleringer for kjemikalier-, avfall- og industriutslipp viktige for å stanse og /eller redusere utslipp av POP-er og for å nå det overordnede målet for Stockholmkonvensjonen om å beskytte menneskers helse og miljøet mot POP-er. Norge gjennomfører også andre tiltak for å stanse eller redusere utslipp av POP-er og har blant annet gjort et omfattende arbeid for å rydde i forurenset grunn og sedimenter.

Norge har allerede reguleringer for de nye POP-ene som ble inkludert i konvensjonen i 2017 (decaBDE, SCCP, HCBD) og 2019 (dicofol og PFOA), samt for endringene i listingen for PFOS som ble vedtatt i 2019. Flere av disse POP-ene vil likevel være en miljømessig bekymring i Norge i lang tid fremover på grunn av langtransporterte atmosfæriske tilførsler, tidligere bruk og fordi noen av POP-ene fortsatt er i begrenset bruk.

Kort om POP-ene som er omtalt i denne NIP-en

Dekabromdifenyleter (dekaBDE) ble listet på partsmøtet i 2017 på bakgrunn av et forslag fra Norge. Parallet utarbeidet Norge i samarbeid med det europeiske kjemikaliebyrået ECHA et forslag om å forby dekaBDE under EU-regelverket REACH. DekaBDE brukes som flammehemmer i plastmaterialer og tekstiler. DekaBDE har ikke vært produsert i Norge, men det har vært omfattende bruk i forbrukerprodukter. DekaBDE ble forbudt i elektriske og elektronisk produkter (EEE) i Norge i 2006 og et bredere nasjonalt forbud mot dekaBDE ble innført i 2008. I 2017 ble denne reguleringen erstattet av et forbud gjennom REACH forskriften. Som følge av listingen i Stockholmkonvensjonen er dekaBDE i dag regulert i Produktforskriften, kapittel 4-1. Noen produkter som inneholder dekaBDE kan fortsatt være i bruk, først og fremst finner vi denne bromerte flammehemmeren i EE-produkter og i avfall fra disse produktene. I Norge er det innført tiltak for å sikre forsvarlig håndtering av avfall som bidrar til å redusere utslipp av dekaBDE og andre POP-er. Det er blant annet etablert returselskaper som samler og håndterer EE-avfall og alle forhandlere av EE-produkter er forpliktet til å ta imot brukte EE-produkter og levere til returselskapene.

Kortkjedete klorparafiner (SCCP) ble listet på partsmøtet i 2017. SCCP ble først og fremst brukt som myknere og brannhemmere og kan finnes i gummi og PVC i i kabler og gulvbelegg, samt i diverse forbrukerprodukter. SCCP har også vært brukt i bygningsmaterialer som maling, fugemasser og gummilister i vinduer. SCCP ble forbudt i Norge i 2001 og ble i 2014 regulert i Produktforskriften, kapittel 4-1 som følge av at stoffet ble listet i POP-protokollen i LRTAP.

Heksaklorbutadien (HCBD) ble inkludert i konvensjonen i 2015 med forbud mot produksjon og bruk. I 2017 ble listingen i konvensjonen utvidet til også å gjelde utilsiktede utslipp fra kjemiske prosesser. HCBD ble tidligere brukt som løsemiddel for produksjon av gummi og andre polymerer, som middel for å rense klorholdig gass eller for å fjerne flyktige organiske forbindelser fra gass, i hydraulikk-, varmeoverførings- eller transformatorvæske, i gyroskoper, i produksjon av aluminium og grafittstenger og som plantevernmiddel. Det har også vært brukt som intermediat i produksjonen av andre kjemikalier og kan dannes utilsiktet som et biprodukt ved produksjon av andre kjemikalier. HCBD har ikke vært produsert eller brukt i Norge. Som følge av at HCBD ble listet i POP-protokollen i LRTAP innførte Norge et forbud mot HCBD gjennom Produktforskriften, kapittel 4-1 i 2014.

Dikofol ble listet på partsmøtet i 2019. Stoffet har vært brukt som insektsmiddel også i Norge, men godkjenningen som plantevernmiddel ble trukket tilbake i 1991 med en avviklingsperiode på to år. Dikofol ble i 2020 regulert i Produktforskriften, kapittel 4-1.

PFOA, dets salter og PFOA-relatere forbindelser ble listet på partsmøtet i 2019. Norge innførte et nasjonalt forbud mot bruk i forbrukerprodukter i 2014 gjennom Produktforskriften, kapittel 2-32. Norge har i samarbeid med Tyskland utarbeidet et generelt forbud mot PFOA, dets salter og PFOA-relatere forbindelser under EU-regelverket REACH som trådte i kraft 2017. I Norge ble dette gjennomført i REACH-forskriften. Denne reguleringen er nå overført til Produktforskriften, kapittel 4-1, som gjennomfører reguleringen av PFOA i EUs POPs forordning i Norge. Perfluorerte stoffer som PFOA er både vann- og fettavvisende. De brukes derfor blant annet til impregnering av tekstiler, i matemballasje, i slipp-belegg i stekepanner og kokekar, og i skismøring. Hovedbruken for PFOA er til produksjon av polymerer. Det finnes lite data om mengdene PFAS-er i produkter, og hva det fører til av utslipp. PFOA-relatere stoffer er stoffer som brytes ned til PFOA over tid. Forhøyede nivåer av PFOA har blitt målt i områder med skigåing, og profesjonelle skismørere i Norge har høyere nivåer av PFOA og andre PFAS i blodet. Dette har ført til at norske myndigheter har satt krav til ventilasjon og retningslinjer for å redusere eksponering for denne yrkesgruppen.

PFOS ble listet i konvensjonen i 2009. PFOS har vært brukt som overflateaktivt stoff i ulike produkter som tekstiler og lærprodukter, som skumdemper i galvanoteknisk industri, i matemballasje, brannskum, gulvpolish, fotografisk og fotolitografiske prosesser, og i hydraulikkvæsker i luftfartsindustrien. PFOS har aldri vært produsert i Norge og bruken av PFOS ble så godt som stoppet i 2007, da forbruk, eksport, import og omsetning ble strengt regulert. Bruken av PFOS i brannskum er stanset i Norge. Før forbudet representerte brannskum den største bruken av PFOS nasjonalt. Arbeidet med å rydde opp i PFOS forurenset grunn er omfattende og pågår fortsatt/ har høy prioritet. For sivile og militære flyplasser er det gjort kartlegginger av forurensningen og laget omfattene planer for oppryddingen. På partsmøtet i 2019 ble listingen av PFOS endret slik at bare ett akseptabelt bruksområde gjensto (bruk som insektsmiddel med sulfluramid for bekjemping av blad-kuttende maur på jordbruksområder) og det ble innført tidsbegrensning på de to gjenværende untakene for bruk av PFOS i brannskum og i skumdemper i hardforkromming i lukket krets.

Norge benytter seg av unntaket for bruk i skumdemper i galvanisk industri, men dette er små mengder. PFOS har siden innføringen av det første forbudet i 2007 vært regulert i flere regelverk i Norge (se Tabell 4) og har siden 2013 vært regulert i Produktforskriften, kapittel 4-1.

SUMMARY

Persistent organic pollutants (POPs) are organic substances that are not readily degradable and remain in the environment for a long time. They bioaccumulate and can cause harmful effects on human health and the environment. They can be transported over long distances by ocean currents and in the atmosphere. Norway's geographical position means that we receive substantial amounts of pollutants via long-range transport. This is particularly the case in the Arctic, where elevated levels of POPs have been found and give reason for concern. Since POPs can be transported over long geographical distances, global measures are necessary to stop this transport and to prevent damage to human health and the environment.

The Stockholm Convention and its obligations

The Stockholm Convention aims to protect human health and the environment from POPs. The Convention entered into force on 17 May 2004. Countries that are Parties to the agreement are obliged to implement measures to eliminate or reduce the production, use and emissions of POPs. Norway ratified the Stockholm Convention on 11 July 2002.

Article 7 of the Convention requires each Party to develop a National Implementation Plan (NIP) that shows how the obligations under the Convention will be implemented. In line with a desicion of the Conference of the Parties (COP) the NIP shall be reviewed and updated periodically, as new substances are listed in the Convention and/ or decisions are made that change the Parties' obligations. The NIP describes regulations and other measures to reduce or eliminate use of POPs, emissions from their stockpiles and waste, environmental monitoring, and research, as well as technical and financial assistance to other countries. Measures that Norway has taken are described in more detail in earlier NIPs.

The Norwegian NIPs

The main focus for this NIP is the POPs that were included in the Convention in 2017 (decaBDE, SCCPs) and in 2019 (dicofol and PFOA), as well as the changes in the listing for HCBD and PFOS that were adopted at the COPs in 2017 and 2019.

The first Norwegian NIP was completed in 2006, two years after the entry into force of the agreement. It discribes national measures for the first 12 POPs that were listed in the

Convention. The NIP has been updated three times since then. Norway continues to work to stop and limit the use of newer POPs. Several of these substances are listed with specific exceptions for certain uses. The table below shows the updates that have been made since the first NIP was submitted in 2006.

Table 1. Overview of the Norwegian NIPs

NIP No.	Date for submission	Contents
1	22.06.2006	The 12 initial POPs: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene, polychlorinated biphenyls (PCBs), polychlorinated dioxins and furans (PCDD/ PCDF) and hexachlorobenzene (HCB)
2	22.01.2013	It covers decisions from the fourth and fifth COP to list chlordecone, hexabrombiphenyl, technical endosulfan and its related isomers, pentachlorobenzene (PeCB), alpha hexachlorocyclohexane (α-HCH), beta hexachlorocyclohexane (β-HCH), and lindane (gamma hexachlorocyclohexane; γ-HCH), and industrial chemicals; tetrabromodiphenyl and pentabromodiphenyl ether (penta-BDE), hexabromodiphenyl ether, heptabromodiphenyl ether (octa-BDE), perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (hereinafter referred to as PFOS)
3	22.01.2017	It covers the decisions of the sixth and seventh COP to list hexabromocyclododecane (HBCDD) from the COP in 2013, and polychlorinated naphthalenes (PCN), hexachlorobutadiene (HCBD) and pentachlorophenol (PCP) from the COP in 2015.
4	28.06.2021	This update covers decisions from the eighth and ninth COP. In 2017, decabromodiphenyl ether (decaBDE), short-chain chlorinated paraffins (SCCPs) and HCBD were listed. In 2019, dicofol, PFOA, its salts and PFOA-related compounds were listed, and the PFOS listing was updated.

Norway's work with the Stockholm Convention

Norway has ambitious national goals for substances that are hazardous to health and the environment and aim to be a key player in the work of phasing out such substances in the EU and globally. Work on the Stockholm Convention has a high priority, and Norway continues to work actively both nationally and in international fora to limit the production and use of POPs to prevent harmful effects to human health and/ or the environment.

Norway has so far nominated five substances for listing in the Convention as POPs. Penta-BDE was nominated in 2005, HBCD in 2008 and deca-BDE in 2013. These substances were listed in 2009, 2013 and 2017, respectively. In 2017 Norway nominated PFHxS, its salts and related substances. Listing of PFHxS will be discussed at the COP-10 in 2022, which has been postponed for one year due to the COVID-19 pandemic. The last substance, Dechlorane Plus, which is a chlorinated flame retardant, was nominated in 2019. The assessment on whether Dechloran Plus is a POP is still ongoing. Norway has been responsible for compiling the knowledge base for all five substances Norway has nominated and contributes to the academic work under the Convention with Norwegian research results and environmental monitoring data.

Norwegian regulations

Norwegian environmental legislation provides the necessary legal basis for Norway to meet the requirements under the Stockholm Convention. In Norway production and use of POPs are prohibited or strictly regulated.

Through the EEA agreement, Norway and the EU have the same environmental regulations. Norway fulfills its obligations under the Stockholm Convention and the POP Protocol in the Convention on Long-range Transboundary Air Pollution (LRTAP) by implementing Regulation (EU) 2019/1021 in Chapter 4 of the Product Regulations. In addition, other regulations for chemicals, waste and industrial emissions are important to eliminate and/ or reduce emissions of POPs and to achieve the overall goal of the Stockholm Convention to protect human health and the environment from POPs. Norway also implements other measures to eliminate or reduce emissions of POPs and has, among other things, done extensive work to clean up contaminated soil and sediments.

Norway already has regulations for the new POPs that were included in the Convention in 2017 (decaBDE, SCCPs, HCBD) and 2019 (dicofol and PFOA), as well as for the changes in listing for PFOS that were adopted in 2019. Nevertheless, several of these POPs will be an environmental concern in Norway for a long time to come, due to long-range atmospheric supplies, past use and because some of the POPs are still in limited use.

Brief description of the POPs included in this NIP

Decabromodiphenyl ether (decaBDE) was listed at the COP in 2017 based on a proposal by Norwegian. In parallel to this, Norway together with the European Chemicals Agency (ECHA), prepared a restriction proposal for decaBDE under the EU REACH Regulation. DecaBDE is used as a flame retardant in plastic materials and textiles. DecaBDE has not been produced in Norway, but there has been extensive use in consumer products. DecaBDE was banned in Electrical and Electronic Equipment (EEE) in Norway in 2006 and a broader national ban on decaBDE was introduced in 2008. In 2017 this regulation was replaced by a ban through the REACH regulation. As a result of its listing in the Stockholm Convention, decaBDE is currently regulated in the Product Regulations, Chapter 4-1. Some products containing decaBDE may still be in use and primarily we find this brominated flame retardant in EEE and in waste from these products. In Norway, measures have been taken to ensure proper management of waste which helps to reduce emissions of decaBDE and other POPs. Return companies have been established to collect and handle EE-waste and all retailers of EEE are obliged to accept used EEE and to deliver these to the Return companies.

Short-chain chlorinated paraffins (SCCPs) were listed at the COP in 2017. SCCPs were mainly used as plasticizers and flame retardants and can be found in rubber and PVC in cables, floorings, as well as various consumer products. In addition, SCCPs have been used in building materials such as paints, sealants and rubber moldings in windows. SCCPs were already banned in Norway in 2001 and have been regulated since 2014 in Chapter 4-1 of the Product Regulations as a result of its listing in the POP protocol in LRTAP.

Hexachlorobutadiene (HCBD) was included in the Convention in 2015 with a ban on production and use. In 2017 its listing in the Convention was extended to also apply to unintentional emissions from chemical processes. HCBD was in the past used as a solvent for the production of rubber and other polymers, as a “scrubber” to recover chlorine-containing gas or to remove volatile organic components from gas; as hydraulic, heat transfer or transformer fluid; in gyroscopes; in the production of aluminium and graphite rods; and as a plant protection product. It has also been used as an intermediate or unitentionally formed as a byproduct in the production of other chemicals. HCBD has not been produced or used in Norway. As a result of its listing in the POP protocol in LRTAP, Norway introduced a ban on HCBD through the Product Regulations, Chapter 4-1 in 2014.

Dicofol was listed at the COP in 2019. The substance has been used as an insecticide in Norway, but the authorisation was withdrawn in 1991 with a grace period of two years. Dicofol has been regulated since 2020 in Chapter 4-1 of the Product Regulations.

PFOA, its salts and PFOA-related compounds were listed at the COP in 2019. Norway introduced a national ban on use in consumer products in 2014 through the Product Regulations, Chapter 2-32. Norway has in collaboration with Germany prepared a general ban on PFOA, its salts and PFOA-related compounds under the EU regulation REACH, which entered into force in 2017. In Norway, this was implemented in the REACH Regulation. The regulation has now been transferred to the Product Regulations, Chapter 4-1, which implements the regulation of PFOA in the EU POPs regulation in Norway. Perfluorinated substances such as PFOA are both water and fat repellent. They are therefore used, among other things, for impregnating textiles, in food packaging, in non-stick coatings in frying pans and cookware and in ski wax. The main use of PFOA is for the production of polymers. There is little data on the amounts of PFAS in products and what it causes in terms of emissions. PFOA-related substances are substances that degrade to PFOA over time. Elevated levels of PFOA have been measured in skiing areas, and professional ski waxers in Norway have higher levels of PFOA and other PFAS in their blood. This has led to requirements for ventilation and measures to reduce exposure to this occupational group.

PFOS was listed in the Convention in 2009. It has been used as a surfactant in various products such as textiles and leather products, as mist suppressants in the galvanic industry, in food packaging, firefighting foam, floor polish, photographic and photolithographic industries, and in hydraulic fluids in the aerospace industry. PFOS has never been produced in Norway and the use of PFOS was virtually stopped in 2007, when consumption, exports, imports and placing on the market were strictly regulated. The use of PFOS in firefighting foam has been stopped in Norway. Prior to the ban, firefighting foam represented the largest use of PFOS nationally. Efforts are being made to clean up PFOS contaminated sites. For civilian and military airports, mapping of the contamination has been conducted and comprehensive plans have been made for the clean-up. At the COP in 2019, the listing of PFOS was amended so that only one acceptable use remained (use as an insecticide with sulfluramide for control of leaf-cutting ants on agricultural areas) and a time limit was

introduced on the two remaining exemptions for use of PFOS in firefighting foam and in mist suppressants in hard chromium plating in closed loop systems. Norway has registered for use in mist suppressants in the galvanic industry, but these are small quantities. PFOS has since the introduction of the first ban in 2007 been regulated in several regulations in Norway (see Table 4) and has since 2013 been regulated in the Product Regulations, Chapter 4-1.

1. INTRODUCTION

This NIP describes how Norway meets its obligations under the Stockholm Convention focusing on newly listed POPs in 2017 and 2019 as well as PFOS, its salts and PFOS-F and hexachlorobutadiene (HCBD), for which updated or new information is available. The available information on all other POPs listed in the Stockholm Convention can be found in the Norwegian NIPs submitted in 2006, 2013 and 2017.

Norway works actively both at the national level and in international fora to limit the production and use of chemicals that can cause harmful effects to human health and/or the environment. Due to the the persistency, bioaccumulation, toxicity and long-range environmental transport of POPs, work on the Stockholm Convention has high priority. Norway has so far nominated five substances for listing in the Convention as POPs. Penta-BDE was nominated in 2005, HBCD in 2008 and deca-BDE in 2013. These substances were listed in 2009, 2013 and 2017, respectively. In 2017, Norway nominated PFHxS, its salts and related substances. The listing of PFHxS will be discussed at COP-10 in 2022, which has been postponed for one year due to the COVID-19 pandemic. The last substance, Dechlorane Plus, which is a chlorinated flame retardant, was nominated in 2019. The assessment on whether Dechloran Plus is a POP is still ongoing.

As an EEA country, Norway fulfills its obligations under the Stockholm Convention by implementing Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants and its amendments (POPs Regulation) in Norwegian law. This regulation imposes bans or restrictions on the production, sale and use of POPs listed in the Stockholm Convention and the UNECE Convention on Long-range Transboundary Air Pollution. The POPs Regulation also contains provisions for managing stockpiles and POPs containing waste as well as requirements to reduce releases of unintentionally produced POPs that may be released to the environment during combustion or from some chemical processes.The POPs Regulation is implemented in Norwegian law through the Norwegian Product Regulations, Chapter 4.

In 2020, Regulation (EU) 2019/1021 on POPs replaced the previous POPs Regulation (EC) 850/2004 with all its amendments. Annex I to Regulation (EU) 2019/1021 lists POPs subject

to prohibitions (with their specific exemptions) on manufacturing, placing on the marked and use. Annex III list the substances subject to release reduction provisions, and Annex IV and V list substances subject to waste management provisions and concentration limits for POPs waste.

In addition to the EU POPs Regulation and as described in more detail in earlier NIPs, several other legislations[1] including The Waste Regulations, the Industry Emission Directive and REACH are relevant for the work to eliminate and/ or reduce releases of POPs and for reaching the overarching objective of the Stockholm Convention to protect human health and the environment from POPs. Several POPs are also on the national priority list of substances, with the objective that emission and use of these hazardous substances must be eliminated. POPs are furthermore included in several of the national monitoring programmes and in research activities. These activities provide important information on the occurrence, levels and trends of POPs in the Norwegian environment and biota. More information on national measures can be found in the previous NIPs.

[1]Other relevant regulations include: Regulation (EC) 1907/2006, a regulation on the Registration, Evaluation, Authorization and restriction of CHemicals (REACH); Regulation (EC) 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP), the Norwegian Biocides Regulation which implements The Biocidal Products Regulation (BPR, Regulation (EU) 528/2012) in Norwegian law; Regulation (EC) No 1107/2009 concerning the placing of plant protection products on the market; RoHS Directive (Directive 2011/65/EU); IED Directive 2010/75/EU on industrial emissions; The Norwegian Waste Regulations with implemented EU legislations.

2. HOW NORWAY IS MEETING ITS OBLIGATIONS

2.1 Information on POPs listed in 2017

The section describes measures for new POPs that were included in the Convention at COP-8 in 2017. The following substances were listed at this meeting: Decabromodiphenyl ether (decaBDE) and short-chain chlorinated paraffins (SCCPs) in Annex A, and the hexachlorobutadiene (HCBD) listing was amended to also include Annex C.

2.1.1 Decabromodiphenyl ether (decaBDE)

Listing under the Stockholm Convention

DecaBDE is included in the Stockholm Convention as: decabromodiphenyl ether (BDE-209) present in commercial decabromodiphenyl ether (CAS No: 1163-19-5). DecaBDE is listed in Annex A with specific exemptions for production and use in vehicles, aircrafts, textiles, additives in plastic housings and parts used for heating home appliances, irons, fans, immersion heaters etc. and in polyurethane foam for building insulation, in accordance with Part IX of that Annex. Norway has not registered for the use of specific exemptions for decaBDE.

Regulatory measures

In Norway, decaBDE was banned in EEE in 2006, when the substance was prohibited in the European Union by its inclusion in the RoHS-Directive EC 2002/95. The RoHS regulation of decaBDE is implemented in Chapter 2a of the Norwegian Product Regulations. In 2008, the manufacture, import, export, sale and use of substances, mixtures and products or flame retarded parts of products containing 0,1% or more of decaBDE was prohibited. Use in vehicles, aircrafts, ships, vessels and rail-bound means of transport such as trains, trams etc. were exempted and still permitted. In 2013, Norway nominated decaBDE to the Stockholm Convention. In parallel to this, Norway together with the European Chemicals Agency (ECHA), prepared a restriction proposal for decaBDE under the EU REACH Regulation. The REACH restriction was adopted in 2016 and implemented in the Norwegian REACH Regulation in 2017, thereby replacing the Norwegian national ban. In 2017, the COP adopted a decision to list decaBDE as a POP in the Stockholm Convention. The global regulation entered into force in 2018. In 2019, EU published the recast POP Regulation (EU) 2019/1021 which included a new entry for deca-BDE in Annex I, thereby replacing the REACH

restriction. In Norway, the EU POP Regulation (EU) 2019/1021 of decaBDE is implemented in Chapter 4 of the Product Regulations.

Other measures

Brominated flame retardants, including decaBDE, was included on the priority list in 1997 with the aim that emission and use of these hazardous substances must be eliminated. Norway has also launched an action plan for brominated flame retardants in 2002.

Production and use

DecaBDE has been one of the most used brominated flame retardants. It has been used in variety of applications including in plastic polymers, textiles, adhesives, sealants, coatings and inks, computers and TVs, wires and cables, pipes and carpets. Important end uses were in commercial textiles including furniture and other interior products, EEE, vehicles and aircrafts.

The consumption of brominated flame retardants including decaBDE in Norway is assumed to have been relatively stable since 2009 due to national bans on several of the substances. In 2013 approximately 280 tonnes of brominated flame retardants were consumed in Norway. Recent figures are not available, but there is little reason to believe that the consumption of this group of substances has changed significantly since 2013 (Miljøstatus, 2021).

Emissions and releases

Emissions and releases of brominated flame retardants like decaBDE can occur during the production, manufacture and use of products and when the products become waste or are recycled. Although production and use of decaBDE is strictly regulated in Norway, the amounts of brominated flame retardants contained in products in Norway is uncertain and makes it difficult to estimate emissions and releases of decaBDE into the environment. However, control, inspection and monitoring activities has shown that decaBDE is found in products on the Norwegian market and is present in wastes.

Indicative of emission and releases from such diffuse sources, brominated flame retardants, including decaBDE, were found in all sludge samples taken from 18 wastewater treatment plants/biogas plants in Norway during the autumn and winter 2017-2018. The average

concentration for sum PBDEs was 30 % lower in 2017/18 than in 2012/13, reflecting a reduction at two of the treatment plants with the highest PBDE concentrations. The decaBDE was the dominating PBDE accounting for >90 % of the sum PBDE (Blytt and Stang, 2018). Environmental monitoring and research activities has detected PBDEs including decaBDE in the environment, in biota and in human samples in Norway. Estimated air concentrations of PBDEs at an urban site in Norway are up to 100 times higher than levels measured at background air monitoring sites suggesting urban areas as sources of emissions of PBDEs, including decaBDE in Norway (NILU, 2018; 2019). However, the results from the urban site should be considered as less certain than the findings from the remote sites due to uncertainties concerning the uptake of decaBDE (BDE-209) in the air sampler used at the urban site.

Waste management

All products containing 0.25 % or more by weight of decaBDE are to be treated as hazardous waste (Waste Regulations, Chapter 11, Annex 2). Discarded EEE products take part in a return system where retailers of EEE are responsibile for collecting used products and for delivering them to return companies. DecaBDE in EEE products is regulated in the EU WEEE Directive. This directive, as part of the EEA agreement, is implemented in Norway through the Waste Regulations (Chapters 1 and 11). The legal base of the WEEE Directive allows stricter implementation and the Norwegian regulation on e-waste is wider than this directive. Norway has, for instance, also included e-waste from industry in the scope of the regulation.

2.1.2 Short-chain chlorinated paraffins (SCCPs)

Listing under the Stockholm Convention

SCCPs are included in the Stockholm Convention as: straight-chain chlorinated hydrocarbons with chain lengths ranging from C10 to C13 and a content of chlorine greater than 48 per cent by weight. The substances with the following CAS numbers may contain short-chain chlorinated paraffins: CAS No. 85535-84-8; CAS No. 68920-70-7; CAS No. 71011-12-6; CAS No. 85536-22-7; CAS No. 85681-73-8; CAS No. 108171-26-2.

SCCPs are listed in Annex A with exemptions for production and for use of SCCPs as additives in transmission belts, rubber conveyor belts, leather, lubricant additives, tubes for outdoor decoration bulbs, paints, adhesives, metal processing, plasticizers. Norway has not registered for the specific exemptions for SCCPs.

Regulatory measures

SCCPs were included in the priority list in 1997 and were banned in Norway in 2001 (Product Regulations, Chapter 2-17). According to this ban, production, import, export, placing on the market and use of SCCPs in pure form, in preparations and in products containing more than 0.1 % of SCCPs were not permitted. However, the stock items imported or produced before 1 January 2001 were allowed to be sold and used until 1 January 2002. In 2014, the Norwegian national ban on this substance was replaced by the EU POPs Regulation (EC) 850/2004, and later by its recast (EU) 2019/1021. This regulation is implemented in national law through Chapter 4 of the Product Regulations.

Production and use

In Norway SCCPs have mainly been used as softeners in paints, plastics, fillers and coatings, as flame inhibitors in rubber, plastics and textiles, and as additives in other chemical substances and products. There has also been limited use in metal working fluids as well as in certain lubricants and car care products. SCCPs are not produced or used in Norway and there is no registered use of SCCPs in Norway after 2004.

Emissions and releases

SCCPs are widespread in the Norwegian environment and biota and has also been found in mothers' milk and serum (Odland et al., 2021; Miljøstatus, 2021). Although SCCP were banned in 2001, emissions can still occur as SCCPs can leak from old products that are still in use - and from contaminated areas. SCCPs have been detected both in run-off from landfills and in sludge and water from wastewater treatment plants. Data from Statistics Norway show that approximately 13 000 tonnes of chlorinated paraffin-containing insulating windows were discarded as waste in 2015. Calculations based on measurements in sewage sludge indicate that approximately 130 kg of SCCPs were released in the environment in 2017. Data from Statistics Norway show that approximately 13 000 tonnes of chlorinated paraffin-containing insulating windows were discarded as waste in 2015. The annual mean SCCP concentration in

air at Zeppelin station at Svalbard in 2019 was 230 pg/m^3 (median 225 pg/m^3, range: 21-420 pg/m^3). No significant difference was observed between the years (2013-2019). SCCPs are found at higher levels in arctic air compared to legacy POPs, most likely due to long-range environmental transport of SCCPs (NILU, 2020a). The results from environmental monitoring in 2019 showed that SCCPs are detected in urban air (passive samplers) in the range of 2.1 to 9.5 ng/day while concentrations in urban soil range from <LOD to 1218 ng/g dw at different locations in Oslo in 2019 (NILU, 2020b). The authors state that SCCP levels in Oslo are high when compared to other published data.

2.1.3 Hexachlorobutadiene (HCBD)

Listing under the Stockholm Convention

HCBD is included in the Stockholm Convention as: Hexachlorobutadiene, CAS No: 87-68-3. HCBD was listed in Annex A without any specific exemptions for production and use at COP 7 in 2015. HCBD was also listed in Annex C (unintentional production) at COP 8 in 2017.

Regulatory measures

Norway introduced restrictions on production and use of HCBD in the Product Regulations, Chapter 4 in 2014 following its listing in the POPs protocol of the LRTAP Convention in 2009, thereby implementing the amendments of the EU POPs Regulation (EC) 850/2004. The EU POPs Regulation (EC) 850/2004 has since been replaced by its recast (EU) 2019/1021, which also regulates unintentional production as covered by the listing in Annex C of the Convention.

Production and use

HCBD is a halogenated aliphatic compound which has been used in several technical and agricultural applications e.g. as an intermediate in the chemical industry or as a commercial product. In the past it was intentionally produced and applied e.g. as a solvent (for rubber and other polymers); as a “scrubber” to recover chlorine-containing gas or to remove volatile organic components from gas; as hydraulic, heat transfer or transformer fluid; in gyroscopes; in the production of aluminium and graphite rods; and as a plant protection product.

HCBD has not been registered in the Norwegian Product Register and is not produced or imported to Norway.

Emissions and releases

HCBD is unintentionally formed and released from industrial processes and other sources. Relevant sources are (1) the production of certain chlorinated hydrocarbons, (2) production of magnesium, and (3) incineration processes (e.g. motor vehicle emissions, incineration processes of acetylene, incineration of chlorine residues). Releases can be minimised by alternative production processes, improved process control, emission control measures, or by substitution of the relevant chlorinated chemicals. Norwegian industry has implemented BAT/BEP to reduce emmissions and releases.

Low levels of HCBD have been found in the aquatic environment in Norway (Miljødirektoratet, 2021). HCBD was also found to be ubiquitosly present in samples from the Arctic environment in Norway (NILU, 2018).

2.2 Information on POPs listed in 2019

The section descripes measures for new POPs that were included in the Convention at COP-9 in 2019 where the following substances were listed: Dicofol, perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds. In addition, the PFOS-listing was amended.

2.2.1 Dicofol

Listing under the Stockholm Convention

Dicofol is included in the Stockholm Convention as: dicofol (CAS No. 115-32-2 and CAS No. 10606-46-9). Dicofol is listed in Annex A without any specific exemptions for production and use.

Regulatory measures

In Norway, dicofol has been used as an insecticide, but the authorisation for use was withdrawn in 1991 with a grace period of two years. Dicofol is regulated by the EU POPs Regulation (EU) 2019/1021 which is implemented in Chapter 4-1 of the Product Regulations.

Production and use

Dicofol was never produced in Norway. Dicofol is an organochlorine miticide. In Norway dicofol was used on fruit, vegetables and ornamentals until 1993.

Emissions and releases

Based on no production and low historic use of dicofol in Norway emissions and releases are expected to be low.

2.2.2 Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds

Listing under the Stockholm Convention

PFOA, its salts and PFOA-related compounds are included in the Stockholm Convention as:
(i) Perfluorooctanoic acid (PFOA; CAS No. 335-67-1), including any of its branched isomers;
(ii) Its salts;
(iii) PFOA-related compounds which, for the purposes of the Convention, are any substances that degrade to PFOA, including any substances (including salts and polymers) having a linear or branched perfluoroheptyl group with the moiety $(C_7F_{15})C$ as one of the structural elements.The following compounds are not included:
(i) C_8F_{17}-X, where X= F, Cl, Br;
(ii) Fluoropolymers that are covered by $CF_3[CF_2]_n$-R', where R'=any group, n>16;
(iii) Perfluoroalkyl carboxylic and phosphonic acids (including their salts, esters, halides and anhydrides) with ≥8 perfluorinated carbons;
(iv) Perfluoroalkane sulfonic acids (including their salts, esters, halides and anhydrides) with ≥9 perfluorinated carbons;
(v) Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF), as listed in Annex B to the Convention.

PFOA, its salts and PFOA-related compounds are listed in Annex A with specific exemptions for use of these substances in accordance with Part X of Annex A:

- Photolithography or etch processes in semiconductor manufacturing
- Photographic coatings applied to films
- Textiles for oil and water repellency for the protection of workers from dangerous liquids that comprise risks to their health and safety

- Invasive and implantable medical devices
- Fire-fighting foam for liquid fuel vapour suppression and liquid fuel fires (Class B fires) in installed systems, including both mobile and fixed systems, in accordance with paragraph 2 of part X of this Annex
- Use of perfluorooctyl iodide for the production of perfluorooctyl bromide for the purpose of producing pharmaceutical products, in accordance with the provisions of paragraph 3 of part X of this Annex
- Manufacture of polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) for the production of:
    - High-performance, corrosion-resistant gas
    - filter membranes, water filter membranes
    - and membranes for medical textiles
    - Industrial waste heat exchanger equipment
    - Industrial sealants capable of preventing
    - leakage of volatile organic compounds and
    - PM2.5 particulates
- Manufacture of polyfluoroethylene propylene (FEP) for the production of high-voltage electrical wire and cables for power transmission
- Manufacture of fluoroelastomers for the production of O-rings, v-belts and plastic accessories for car interiors

Regulatory measures

PFOA was included on the priority list in 2007. Norway introduced a national ban on PFOA and its salts in consumer products in 2014 (Product Regulations, Chapter 2-32). This regulation was replaced by an amendment of the REACH Regulation (EC) 1907/2006 in 2017. The REACH restriction of PFOA was substituted by an amendment to the EU POPs-Regulation (EU) 2019/1021, which was implemented in Norwegian law through Chapter 4 of the Product Regulations in 2021.

Other measures

Based on several similar effects in animals, toxicokinetics and observed concentrations in human blood, the Panel on Contaminants in the Food Chain (CONTAM), a scientific advisory panel to the European Food Safety Authority decided to perform an assessment for the sum of

four PFASs: PFOA, PFNA, PFHxS and PFOS. Since accumulation over time is important, a tolerable weekly intake (TWI) of 4.4 ng/kg bw per week was established. This TWI also protects against other potential adverse effects observed in humans. Based on the estimated lower boundary exposure, but also reported serum levels, CONTAM concluded that parts of the European population exceed this TWI, which is of concern (EFSA 2020). The decreased response of the immune system to vaccination was considered to be the most critical human health effect when determining the TWI.

Production and use

PFOA, its salts and PFOA-related compounds have never been produced in Norway. They have been used in several applications because of their surfactant properties i.e. as coating agent for carpets, in textiles, furniture, shoes, paper, food wraps, printing plates but also in paint, floor wax, glue and photograpic film. PFOA is often present in products as a chemical impurity or as trace contaminant from the production of other perfluorinated compounds, e.g. fluoropolymers and side-chain fluorinated polymers. Polytetrafluoroethylene (PTFE) and polyvinylfluoride (PVDF) are fluoropolymers that are mainly produced with PFOA. In Norway, PFOA has been found in imported products like water and stain repellent textiles. PFOA has also be found in food contact materials with non-stick properties and in fire-fighthing foam. PFOA was previously often present in ski wax in small amounts as a chemical impurity of the perfluorinated constituents in the wax and fluorinated powder products for ski-waxing. In Norway the occupational exposure of professional ski-waxers to PFOA were shown to be higher than for non-occupational users; blood serum values were 25 fold higher (rang 15-175 ng/ ml) than previously measured among people with a high consumption of fish (Daae et al., 2009). Requirements to ventilation and use has been introduced for professional ski-waxers to reduce their exposure to PFAS (Daae et al., 2009).

Emissions and releases

Detections of PFOA in sewage treatment plants and landfill effluents show that diffuse emissions are a source of PFOA in the environment. However, there are great uncertainties linked to the consumption and emission of PFOA in Norway, particularly regarding the quantity of PFOA in imported products. In a study from ten different Norwegian landfills, including one site in Svalbard, receiving primarily municipal solid waste and in some cases industrial waste and contaminated soil and sewage sludge, median PFOA level in leachate

were 120 µg/L (range, 66-1800) indicating that landfills can be a source for release of PFOA into the Norwegian environment (Knutsen et al., 2019).

PFOA was also detected at selected muncipal firebrigade training sites and in some firefighting foams used by muncipal firebrigades, although 6:2 FTS was the main PFAS detected reflecting a transition to 6:2 FTS based foams (NGI, 2019a). A fact sheet has been made to inform muncipal firebrigades, schools and other uses of PFAS-foam on measures to be taken to reduce the impact on the environment (Miljødirektoratet 2020).

PFOA is currently widely dispersed in the Norwegian environment including the Arctic, where it is detected in several species including sea birds, seals and polar bears. PFOA levels in polar bears in the Norwegian Arctic has increased significantly over the past 20-30 years. Other more volatile, perflourinated compounds have also been detected, which can slowly degrade to PFOA. Model calculations show that concentrations of PFOA in the Arctic will continue to increase until 2030.

Human biomonitoring data from Norway suggests higher exposure in infants than adults. One study estimated that breast-fed infants in Norway at around 6 months take up 4.1 ng PFOA per kg body weight, which is 15 times higher than the uptake in adults (Haug et al., 2011). Two other Norwegian studies have shown that PFOA levels in maternal blood had decreased six and twelve months after childbirth, whereas PFOA levels in the serum of six-month-old infants were 4.6 times higher than maternal blood levels during childbirth (Thomsen et al., 2010, Fromme et al., 2010). PFOA levels are observed to decline in human serum samples from Northern Norway from 2007 to 2020 (Odland et al., 2021).

2.2.3 PFOS, its salts and PFOS-F

Listing under the Stockholm Convention

Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) are listed in Annex B to the Convention. PFOS and 96 PFOS-related substances have been identified and were part of the original nomination (Annex 1). Thus, the listing of PFOS includes, but is not limited to the following CAS no.: Perfluorooctane sulfonic acid (CAS No:

1763-23-1), its salts[2] and perfluorooctane sulfonyl fluoride (CAS No: 307-35-7). Herein after referred to as PFOS.

Under the Stockholm Convention production and use of PFOS is still allowed for specific use areas. In the listing from 2009 a total of 20 acceptable purposes and specific exemptions were given (Table 2):

Table 2. Exemptions* for PFOS available to Parties following the listing in 2009

Acceptable purpose:	**Specific exemption:**
In accordance with Part III of Annex B for the following acceptable purposes, or as an intermediate the production of chemicals with the following acceptable purpose: • Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching-agent for compunt semi-conductors and ceramic filters • Aviation hydraulic fluids • Metal plating (hard-metal plating) only in closed loop systems • Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio opaque ETFE production, *in-vitro* diagnostic medical devices, and CCD colour filters). • Fire-fighting foam • Insect baits for control of leaf-cutting ants from *Atta spp.* and *Acromyrmex spp.*	For the following specific uses, or as an intermediate in the production of chemicals with the following specific uses: • Photo-masks in the semi-conductor and liquid crystal display (LCD) industries • Metal plating (hard-metal plating) • Metal plating (decorative plating) • Electrical 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 • Texiles and upholstery • Paper and packaging • Coatings and coating additives • Rubber and plastics

[2] For example: potassium perfluorooctane sulfonate (CAS no. 2795-39-3)
lithium perfluorooctane sulfonate (CAS no. 29457-72-5)
ammonium perfluorooctanesulfonate (CAS no. 29081-56-9)
diethanolammonium perfluorooctane sulfonate (CAS no. 70225-14-8)
tetraethylammonium perfluorooctane sulfonate (CAS no. 56773-42-3), didecyldimethylammonium perfluorooctane sulfonate (CAS no. 251099-16-8)

*As of May 2015 (COP-7) no Parties are registered for the following specific exemptions for the use of PFOS: carpets, leather and apparel, textiles and upholstery, paper and packaging, coatings and coating additives and rubber and plastics. Hence no new registrations for the use of PFOS in these exemptions are available.

COP-9 in 2019 amended the acceptable purposes and specific exemptions for PFOS in Annex B to the Stockholm Convention, and prescribed several actions related to PFOS. These amendments entered into force on 3 December 2020 for most Parties.

Table 3. Exemptions* for PFOS available to Parties as of 2020

Acceptable purpose:	**Specific exemption:**
In accordance with Part III of Annex B for the following acceptable purpose, or as an intermediate in the production of chemicals with the following acceptable purpose: • Insect baits with sulfluramid (CAS No. 4151-50-2) as an active ingredient for control of leaf-cutting ants from Atta spp. and Acromyrmex spp. for agricultural use only	• Metal plating (hard-metal plating) only in closed-loop systems • Fire-fighting foam for liquid fuel vapour suppression and liquid fuel fires (Class B fires) in installed systems, including both mobile and fixed systems, in accordance with paragraph 10 of part III of Annex B.

Regulatory measures and other measures

Norway has taken several regulatory measures and other measures to reduce the emissions and potential environmental and health hazards resulting from exposure to PFOS. The most important measure was a general ban on PFOS and PFOS-related substances which was introduced in April 2007. An overwiev of regulatory measures and other measures for PFOS is provided in Table 4.

PFOS, PFOA, PFHxS and long chained perfluorated acids as well as some short chain-PFAS are on Norway's list of priority substances with a goal that emission and use must be eliminated and are to be phased out or substantially reduced. The emission, environmental levels, and current use of PFOS is monitored regularly, by environmental monitoring and screening and by conducting targeted surveys and assessments as well as inspections to ensure compliance. In 2005 the first action plan was developed and put into effect. The action plan has since been updated regularly. The last update was for the period 2016-2018 (Klif, 2008a,

Miljødirektoratet, 2016). PFOS is also included in the list of priority substance under EU Water Framework Directive, which is also applicable to Norway.

Table 4. Regulatory measures and other measures taken by Norwegian authorities to reduce or eliminate emissions and releases of PFOS

Measure	Regulation	Comments
Ban of the use of PFOS in various products in 2007	Product Regulations, Section 2-23	PFOS and PFOS-related compounds in textiles, impregnating agents and fire foam It is prohibited to manufacture, import, export and sell impregnating agents containing 0.005% by weight or more of PFOS or PFOS-related compounds. It is prohibited to manufacture, import, export, sell or use fire foam containing 0.005% by weight or more of PFOS or PFOS-related compounds. It is also forbidden to have fire extinguishing systems with foam that contain 0.005% by weight or more of PFOS or PFOS-related compounds. Fire foam containing 0.005% by weight or more of PFOS or PFOS-related compounds must be delivered to an approved reception for destruction. From 1 July 2007, it is prohibited to produce, import, export and sell textiles or other coated materials if the amount of PFOS or PFOS-related compounds is equal to or higher 1 microgram per square meters.
Possession of PFOS containing fire-fighting foam was banned in 2011	Product Regulations, Section 2-9	It is prohibited to possess fire-fighting foams that contain 0.005 % by weight and more of PFOS or PFOS-related substances and must be delivered to destruction plants.
Possession of PFOS containing fire-fighting foam was banned in 2013	Product Regulations, Section 2-9	It is prohibited to possess fire-fighting foams that contain 0.001 % by weight and more of PFOS or

		PFOS-related substances and must be delivered to destruction plants.
Ban of the use of PFOS in various products, as well as provisions for wastes containing PFOS from 2013	Product Regulations, Section 4-1 implementing the amendment to the EU POPs Regulation (EC) 850/2004, and later by its recast EU POPs Regulation (EU) No 2019/1021 (as described below)	Placing on the market and use of PFOS at concentrations equal to or below 10 mg/kg (0,001 % by weight) when it occurs in substances or in preparations was restricted in accordance with the listing in the Convention and the acceptable purposes and specific exemptions relevant to the EU.
Ban of the use of PFOS in various products from 2021	Amendment of EU POPs Regulation (EU) No 2019/1021, regards the entry of PFOS	Placing on the market and use of PFOS in concentrations of PFOS equal to or below 10 mg/kg (0,001 % by weight) when it occurs in substances or in preparations was restricted in according to listing in the Convention from COP 2019 as relevant for EU. The specific exemption for the use in metal plating (hard metal plating) only in closed-loop system are allowed for a maximum periode of five year.
Regulation of waste disposal	Product Regulations, Section 4-1 implementing the amendment to the EU POPs Regulation (EC) 850/2004, and later by its recast (EU) 2019/1021 Guidance on monitoring of leachate from landfills (SFT, 2005)	
An action plan with focus on per- and polyfluorinated substances for the period 2016-2018 (Klif 2008a). List of Priority Substances Assessments, monitoring and screening		PFOS emissions have been reduced PFOS is still a ubiquitous contaminant of the Norwegian environment.

Besides the national measures taken, Norway also follows and takes part in various international initiatives aiming to reduce emissions of PFOS by increasing the knowledge on the occurrence, use and environmental/ and health properties of PFOS. Relevant forums include the EU, OECD, AMAP, the Nordic Council of Ministers, OSPAR and the International Maritime Organization (IMO).

Production and use

PFOS was never produced in Norway. Consumption and use of PFOS was virtually halted in 2007, when a national ban was introduced. Up until the ban, the main use of PFOS in Norway was in fire-fighting foam known as aqueous film forming foam (AFFF) (Klif, 2005). The historical use of PFOS in AFFF was extensive due to use of AFFF in connection to airport fire-training fields, military airports and off-shore activities. Norway was previously registered for an acceptable purpose for the use of PFOS in photo-imaging, photo-resist and anti-reflective coatings for semi-conductors, etching agent for compound semi-conductors and ceramic filters, aviation hydraulic fluids and metal plating (hard metal plating) only in closed-loop systems. As of today, Norway is only registred for the specific exemption for the use of PFOS in metal plating as PFOS is still used as a defoamer/ mist suppressant in chromium plating in the metal plating industry. The use however is very limited. In the case of fire-fighting foams the phase-out of PFOS was confirmed by a survey (January 2012) undertaken by the Norwegian Climate and Pollution Agency (now Norwegian Environment Agency). Though the aim of the survey was to map alternatives to the use of PFOS in open applications the survey also checked that none of the businesses that answered the distributed questionnaire (about 35% of total) used fire-fighting foam containing PFOS or PFOS related substances. The availability and use of fluorine-free fire-fighting foams has increased in several sectors (i.e. offshore, onshore oil and gas refinery, civil- and military airports) in Norway.

Emissions and releases

The main source of releases of PFOS in Norway is most likely contaminated ground at fire training/ drill sites where PFOS-containing fire-fighting foam were used in the past. PFOS from these sites may still leak into the environment. Besides fire-fighting foam and contaminated ground at fire training sites other sources to releases may be from articles in use and releases from waste.

Since 2007, the Norwegian Environment Agency has worked systematically to investigate, order the liable parts to investigate, and to remediate PFOS-contaminated soils at fire fighting sites at airports (Klif, 2008b). Avinor, a state-owned limited company that operates and owns most (44 in total) of the civilian airports in Norway, have conducted two rounds of suveys (Avinor 2011; 2019 a,b). Eight military airports have been investigated as well. Investigations

have included samples of both soil, groundwater, surface water, sediments and biota. At many of these sites, fire-fighting foam containing PFOS have been out of use for almost a decade. Still, PFOS is found in high concentration in both soil, water and biota (including freshwater fish).

In 2018, the Norwegian Environment Agency ordered Avinor to make a summary report on how much PFOS and other PFAS that are still present in soils around their fire fighting sites (civil airports), and to prepare a priority list over remediation actions. Locations for the most cost/efficient remediation of PFOS-contaminated soils was reported along with information on PFOS concentration levels and information on sites that pose a local risk to health and/or environment. As a follow up, Avinor shall remediate two airports-sites per year, with a goal of reducing PFOS in soils around airport firefighting sites with 80 % before 2027, as well as reducing the local risk for health and environmental damage substantially. A plan for remediation at eight airports within 2027 was recently made based on an overall assessment of PFAS-contamination sites at 39 airports (Avinor 2019a,b). A similar process is in progress for the 10 military airports. Up to now, four military and civil airports have been remediated or are under remediation today, including the largest airport with the highest amounts of PFOS in the soil. PFAS contaminations at selected muncipal firebrigade training sites have also been investigated (NGI, 2019a).

In the lake monitoring program, the annual monitoring activities detected high levels of PFOS in fish from one lake. In 2017 and 2018, the findings were followed up by further monitoring and source tracing of PFOS and PFAS contamination in lake and river sediments and biota. The results of the source tracing showed the elevated PFOS levels to be linked to a former production site for food contact paper products (Miljødirektoratet 2018, NGI 2019b). A remediation plan for this site is still under development, and include both contaminated soil, river sediment and lake sediment.

Waste management

PFOS is still used for specific applications and may still exist in products that were placed on the market before the ban was introduced in 2007. PFOS containing articles and products will continue to enter the waste stream for some years, although in presumably lower and decreasing volumes. In a study from ten different Norwegian landfills, including one site in

Svalbard, receiving primarily municipal solid waste and in some cases industrial waste and contaminated soil and sewage sludge, median PFOS level in leachate were 65 μg/L (range, 15-165) and levels in sediments were 13 (range 1.3-25 μg /kg dry weight) (Knutsen et al., 2019). The study shows that PFOS can be released from old landfills to the Norwegian environment.

Excavation of PFOS-contaminated soil might be problematic, as most landfills do not have any possibility for removal of perfluorinated compounds in their leachate treatment. To make sure that soil with high concentrations of PFOS are not put in landfills without special technology for stopping PFOS dispersals, the national authorities have banned normal landfills from accepting PFAS-contaminated soil. Since 2018 there are two operating PFAS-landfills in Norway. Both landfills have PFAS-absorbing membranes, as well as wastewater treatment spesially designed for adsorbing PFAS.

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4. ANNEX 1 PFOS RELATED SUBSTANCES

Ref.-nr.	CAS- nummer	PFOS-relatert forbindelse
1	307-35-7	1-Octanesulphonyl fluoride, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
2	376-14-7	2-Propenoic acid, 2-methyl-, 2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl ester
3	383-07-3	2-Propenoic acid, 2-[butyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl ester
4	423-82-5	2-Propenoic acid, 2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl ester
5	423-86-9	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-2-propenyl-
6	754-91-6	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
7	1652-63-7	1-Propanaminium, 3-[[(heptadecafluorooctyl)sulphonyl]amino]-*N*,*N*,*N*-trimethyl-, iodide
8	1691-99-2	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(2-hydroxyethyl)-
9	1763-23-1	1-Octanesulphonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
10	1869-77-8	Glycine, *N*-ethyl-*N*-[(heptadecafluorooctyl)sulphonyl]-, ethyl ester
11	2250-98-8	1-Octanesulphonamide, *N*,*N*',*N*''- [phosphinylidynetris(oxy-2,1-ethanediyl)]tris[*N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
12	2263-09-4	1-Octanesulphonamide, *N*-butyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(2-hydroxyethyl)-
13	2795-39-3	1-Octanesulphonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, potassium salt
14	2991-50-6	Glycine, *N*-ethyl-*N*-[(heptadecafluorooctyl)sulphonyl]-
15	2991-51-7	Glycine, *N*-ethyl-*N*-[(heptadecafluorooctyl)sulphonyl]-, potassium salt
16	3820-83-5	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-[2-(phosphonooxy)ethyl]-
17	3871-50-9	Glycine, *N*-ethyl-*N*-[(heptadecafluorooctyl)sulphonyl]-, sodium salt
18	4151-50-2	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
19	13417-01-1	1-Octanesulphonamide, *N*-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
20	14650-24-9	2-Propenoic acid, 2-methyl-, 2- [[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl ester
21	24448-09-7	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(2-hydroxyethyl)-*N*-methyl-
22	24924-36-5	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-2-propenyl-
23	25268-77-3	2-Propenoic acid, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl ester
24	29081-56-9	1-Octanesulphonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, ammonium salt
25	29117-08-6	Poly(oxy-1,2-ethanediyl), .alpha.-[2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl]-.omega.-hydroxy-
26	29457-72-5	1-Octanesulphonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, lithium salt
27	30295-51-3	1-Octanesulphonamide, N-[3-(dimethyloxidoamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-
28	30381-98-7	1-Octanesulphonamide, *N*,*N*'-[phosphinicobis(oxy-2,1-ethanediyl)]bis[*N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, ammonium salt
29	31506-32-8	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-methyl-
30	38006-74-5	1-Propanaminium, 3-[[(heptadecafluorooctyl)sulphonyl]amino]-*N*,*N*',*N*''-trimethyl-, chloride

Ref.-nr.	CAS- nummer	PFOS-relatert forbindelse
31	50598-29-3	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(phenylmethyl)-
32	52550-45-5	Poly(oxy-1,2-ethanediyl), α-[2-[[(heptadecafluorooctyl)sulphonyl]propylamino]ethyl]-ω -hydroxy-
33	56773-42-3	Ethanaminium, *N,N',N''*-triethyl-, salt with 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulphonic acid (1:1)
34	57589-85-2	Benzoic acid, 2,3,4,5-tetrachloro-6-[[[3-[[(heptadecafluorooctyl)sulphonyl]oxy]phenyl]amino]carbonyl]-, monopotassium salt
35	58920-31-3	2-Propenoic acid, 4-[[(heptadecafluorooctyl)sulphonyl]methylamino]butyl ester
36	61577-14-8	2-Propenoic acid, 2-methyl-, 4-[[(heptadecafluorooctyl)sulphonyl]methylamino]butyl ester
37	61660-12-6	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-[3-(trimethoxysilyl)propyl]-
38	67939-42-8	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-[3-(trichlorosilyl)propyl]-
39	67969-69-1	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-[2-(phosphonooxy)ethyl]-, diammonium salt
40	67939-88-2	1-Octanesulphonamide, *N*-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, monohydrochloride
41	68081-83-4	Carbamic acid, (4-methyl-1,3-phenylene)bis-, bis[2-[ethyl[(perfluoro-C4-8-alkyl)sulphonyl]amino]ethyl] ester
42	68298-11-3	1-Propanaminium, 3-[[(heptadecafluorooctyl)sulphonyl](3-sulphopropyl)amino]-*N*-(2-hydroxyethyl)-*N,N*-dimethyl-, hydroxide, inner salt
43	68329-56-6	2-Propenoic acid, eicosyl ester, polymer with 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl 2-propenoate, hexadecyl 2-propenoate, 2-[methyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-propenoate and octadecyl 2-propenoate
44	68239-73-6	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(4-hydroxybutyl)-*N*-methyl-
45	68310-75-8	1-Propanaminium, 3-[[(heptadecafluorooctyl)sulphonyl]amino]-*N,N',N''*-trimethyl-, iodide, ammonium salt
46	68541-80-0	2-Propenoic acid, polymer with 2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate and octadecyl 2-propenoate
47	68555-90-8	2-Propenoic acid, butyl ester,polymer with 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl 2-propenoate, 2-[methyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-propenoate and 2-[methyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-propenoate
48	68555-91-9	2-Propenoic acid, 2-methyl-, 2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl ester, polymer with 2-[ethyl[(nonafluorobutyl)sulphonyl]amino] ethyl 2-methyl-2-propenoate, 2-[ethyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2- [ethyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate and octadecyl 2-methyl-2-propenoate
49	68555-92-0	2-Propenoic acid, 2-methyl-, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl ester, polymer with 2- [methyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2- [methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2- [methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2- [methyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate and octadecyl 2-methyl-2-propenoate

Ref.-nr.	CAS- nummer	PFOS-relatert forbindelse
50	68608-14-0	Sulphonamides, C4-8-alkane, perfluoro, *N*-ethyl-*N*-(hydroxyethyl), reaction products with 1,1'-methylenebis[4-isocyanatobenzene]
51	68649-26-3	1-Octanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(2-hydroxyethyl)-, reaction products with *N*-ethyl-1,1,2,2,3,3,4,4,4-nonafluoro-*N*-(2-hydroxyethyl)-1-butanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoro-*N*-(2-hydroxyethyl)- 1-heptanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluoro-*N*-(2-hydroxyethyl)-1-hexanesulphonamide, *N*-ethyl-1,1,2,2,3,3,4,4,5,5,5-undecafluoro-*N*-(2-hydroxyethyl)-1-pentanesulphonamide, polymethylenepolyphenyleneisocyanate and stearyl alc.
52	68867-60-7	2-Propenoic acid, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl ester, polymer with 2-[methyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-propenoate and.alpha.-(1-oxo-2-propenyl)-.omega.-methoxypoly(oxy-1,2-ethanediyl)
53	68877-32-7	2-Propenoic acid, 2-methyl-, 2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl ester, polymer with 2-[ethyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(tridecafluoro-hexyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(undecafluoro-pentyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate and 2-methyl-1,3-butadiene
54	68891-96-3	Chromium, diaquatetrachloro[.mu.-[*N*-ethyl-*N*- [(heptadecafluorooctyl)sulphonyl] glycinato-.kappa.O:.kappa.O']]-.mu.-hydroxybis(2-methylpropanol)di-
55	68909-15-9	2-Propenoic acid, eicosyl ester, polymers with branched octylacrylate, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl acrylate, 2-[methyl [(nonafluorobutyl)sulphonyl]amino]ethyl acrylate, 2-[methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl acrylate, 2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl acrylate, 2-[methyl[(undecafluoropentyl)sulphonyl]amino]ethyl acrylate, polyethylene glycol acrylate Me ether and stearyl acrylate
56	68958-61-2	Poly(oxy-1,2-ethanediyl), .alpha.-[2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl]-.omega.-methoxy-
57	70225-14-8	1-Octanesulphonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, compd. with 2,2'-iminobis[ethanol] (1:1)
58	70776-36-2	2-Propenoic acid, 2-methyl-, octadecyl ester, polymer with 1,1-dichloroethene, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl 2-propenoate, *N*-(hydroxymethyl)-2-propenamide, 2-[methyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-propenoate and 2-[methyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-propenoate
59	71463-78-0	Phosphonic acid, [3-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]propyl]-
60	71463-80-4	Phosphonic acid, [3-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]propyl]-, diethyl ester
61	71487-20-2	2-Propenoic acid, 2-methyl-, methyl ester, polymer with ethenylbenzene, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl 2-propenoate, 2-[methyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-propenoate, 2-[methyl[(undecafluoropentyl)sulphonyl]amino]ethyl 2-propenoate and 2-propenoic acid
62	91081-99-1	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-(hydroxyethyl)-*N*-methyl, reaction products with epichlorohydrin, adipates (esters)
63	92265-81-1	Ethanaminium, *N*,*N*,*N*-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)oxy]-, chloride, polymer with 2-ethoxyethyl 2-propenoate, 2-[[(heptadecafluorooctyl)sulphonyl] methylamino]ethyl 2-propenoate and oxiranylmethyl 2-methyl-2-propenoate

64	94133-90-1	1-Propanesulphonic acid, 3-[[3-(dimethylamino)propyl][(heptadecafluorooctyl) sulphonyl]amino]-2-hydroxy-, monosodium salt
65	94313-84-5	Carbamic acid, [5-[[[2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethoxy]carbonyl]amino]-2-methylphenyl]-, 9-octadecenyl ester, (Z)-
66	98999-57-6	Sulphonamides, C_{7-8}-alkane, perfluoro, *N*-methyl-*N*-[2-[(1-oxo-2-propenyl)oxy]ethyl], polymers with 2-ethoxyethyl acrylate, glycidyl methacrylate and *N*,*N*,*N*-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)oxy]ethanaminium chloride
67	127133-66-8	2-Propenoic acid, 2-methyl-, polymers with Bu methacrylate, lauryl methacrylate and 2-[methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino]ethyl methacrylate
68	129813-71-4	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-methyl-*N*-(oxiranylmethyl)
69	148240-78-2	Fatty acids, C_{18}-unsatd., trimers, 2-[[heptadecafluorooctyl)sulphonyl]methylamino]ethyl esters
70	148684-79-1	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-(hydroxyethyl)-*N*-methyl, reaction products with 1,6-diisocyanatohexane homopolymer and ethylene glycol
71	160901-25-7	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-ethyl-*N*-(hydroxyethyl), reaction products with 2-ethyl-1-hexanol and polymethylenepolyphenylene isocyanate
72	178094-69-4	1-Octanesulphonamide, *N*-[3-(dimethyloxidoamino)propyl]-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-,potassium salt
73	178535-22-3	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-ethyl-*N*-(hydroxyethyl)-, polymers with 1,1'-methylenebis[4-isocyanatobenzene] and polymethylenepolyphenylene isocyanate, 2-ethylhexyl esters, Me Et ketone oxime-blocked
74	182700-90-9	1-Octanesulphonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-methyl-, reaction products with benzene-chlorine-sulphur chloride (S_2Cl_2) reaction products chlorides
75	L-92-0151 (US Pre-manufacture notice)	2-Propenoic acid, 2-methyl-, butyl ester, polymer with 2-[ethyl[(heptadecafluorooctyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(nonafluorobutyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(pentadecafluoroheptyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate, 2-[ethyl[(tridecafluorohexyl)sulphonyl]amino]ethyl 2-methyl-2-propenoate and 2-propenoic acid
76	P-94-2205 (US Pre-manufacture notice)	Polymethylenepolyphenylene isocyanate and bis(4-NCO-phenyl)methane reaction products with 2-ethyl-1-hexanol, 2-butanone, oxime, *N*-ethyl-*N*-(2- hydroxyethyl)-1-C_4-C_8 perfluoroalkanesulphonamide
77	192662-29-6	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-[3-(dimethylamino)propyl], reaction products with acrylic acid
78	251099-16-8	1-Decanaminium, *N*-decyl-*N*,*N*-dimethyl-, salt with 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulphonic acid (1:1)
79	306973-46-6	Fatty acids, linseed-oil, dimers, 2-[[(heptadecafluorooctyl)sulphonyl]methylamino]ethyl esters
80	306973-47-7	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-(hydroxyethyl)-*N*-methyl, reaction products with 12-hydroxystearic acid and 2,4-TDI, ammonium salts
81	306974-19-6	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*-methyl-*N*-[(3-octadecyl-2-oxo-5-oxazolidinyl)methyl]
82	306974-28-7	Siloxanes and Silicones, di-Me, mono[3-[(2-methyl-1-oxo-2-propenyl)oxy]propylgroup] -terminated, polymers with 2-[methyl[(perfluoro-C4-8-alkyl)sulphonyl]amino]ethyl acrylate and stearyl methacrylate
83	306974-45-8	Sulphonic acids, C_{6-8}-alkane, perfluoro, compounds with polyethylene-polypropylene glycol bis(2-aminopropyl) ether
84	306974-63-0	Fatty acids, C_{18}-unsatd.,dimers, 2-[methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino] ethyl esters
85	306975-56-4	Propanoic acid, 3-hydroxy-2- (hydroxymethyl)-2-methyl-, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and *N*,*N*',2-tris(6-isocyanatohexyl)imidodicarbonic diamide, reaction products with *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(2-hydroxyethyl)-1-octanesulphonamide and *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoro-*N*-(2-hydroxyethyl)-1-heptanesulphonamide, compounds with triethylamine

86	306975-57-5	Propanoic acid, 3-hydroxy-2-(hydroxymethyl)-2-methyl-, polymer with 1,1'-methylenebis[4- isocyanatobenzene] and 1,2,3-propanetriol, reaction products with *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-*N*-(2-hydroxyethyl)-1-octanesulphonamide and *N*-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoro-*N*-(2-hydroxyethyl)-1-heptanesulphonamide, compounds with morpholine
87	306975-62-2	2-Propenoic acid, 2-methyl-, dodecyl ester, polymers with 2- [methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino]ethyl acrylate and vinylidene chloride
88	306975-84-8	Poly(oxy-1,2-ethanediyl), .alpha.-hydro-.omega.-hydroxy-, polymer with 1,6-diisocyanatohexane, *N*-(hydroxyethyl)-*N*-methyl perfluoro C_{4-8}-alkane sulphonamides-blocked
89	306975-85-9	2-Propenoic acid, 2-methyl-, dodecyl ester, polymers with *N*-(hydroxymethyl)-2-propenamide, 2-[methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino]ethyl methacrylate, stearyl methacrylate and vinylidene chloride
90	306976-25-0	1-Hexadecanaminium, *N*,*N*-dimethyl-*N*-[2-[(2-methyl-1-oxo-2-propenyl)oxy]ethyl]-, bromide, polymers with Bu acrylate, Bu methacrylate and 2-[methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino]ethyl acrylate
91	306976-55-6	2-Propenoic acid, 2-methyl-, 2-methylpropyl ester, polymer with 2,4-diisocyanato-1-methylbenzene, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol and 2-propenoic acid, *N*-ethyl-*N*-(hydroxyethyl)perfluoro-C_{4-8}-alkanesulphonamides-blocked
92	306977-58-2	2-Propenoic acid, 2-methyl-, 3-(trimethoxysilyl)propyl ester, polymers with acrylic acid, 2-[methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino]ethyl acrylate and propylene glycol monoacrylate, hydrolysed, compounds with 2,2'-(methylimino)bis[ethanol]
93	306978-04-1	2-Propenoic acid, butyl ester, polymers with acrylamide, 2-[methyl[(perfluoro-C_{4-8}-alkyl)sulphonyl]amino]ethyl acrylate and vinylidene chloride
94	306978-65-4	Hexane, 1,6-diisocyanato-, homopolymer, *N*-(hydroxyethyl)-*N*-methyl perfluoro-C_{4-8}-alkane sulphonamides- and stearyl alc.-blocked
95	306979-40-8	Poly(oxy-1,2-ethanediyl), .alpha.-[2-(methylamino)ethyl]-.omega.-[(1,1,3,3-tetramethylbutyl)phenoxy]-, *N*-[(perfluoro-C_{4-8}-alkyl)sulphonyl]
96	306980-27-8	Sulphonamides, C_{4-8}-alkane, perfluoro, *N*,*N*'-[1,6-hexanediylbis[(2-oxo-3,5-oxazolidinediyl)methylene]]bis[*N*-methyl-