

# Strategy for reducing the use of highly fluorinated substances, PFASs

Interim report as part of a Government assignment

REPORT 11/16



The Swedish Chemicals Agency is supervisory authority under the Government. We work in Sweden, the EU and internationally to develop legislation and other incentives to promote good health and improved environment. We monitor compliance of applicable rules on chemical products, pesticides and substances in articles and carry out inspections. We review and authorise pesticides before they can be used. Our environmental quality objective is A Non-toxic Environment.

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## Preface

In December 2010 the Swedish Government assigned the Swedish Chemicals Agency (KEMI) to prepare and implement an action plan for a toxic-free everyday environment: *Action plan for a toxic-free everyday environment 2011 – 2014 – protect the children better*. The action plan has been extended to 2020. Work is ongoing in several areas, both in Sweden, within the EU and globally and often in cooperation with other authorities.

Reducing chemical risks in the everyday environment is one step towards attaining the Swedish Parliament's environmental quality objective A Non-Toxic Environment, which is the objective that the Swedish Chemicals Agency is responsible for. Within the framework of the action plan, we compile knowledge in the Swedish Chemicals Agency's report and PM series elaborated by experienced colleagues, researchers or consultants. In this way, we present new and essential knowledge in publications which can be downloaded from the website [www.kemikalieinspektionen.se](http://www.kemikalieinspektionen.se).

One focal area for the action plan is highly fluorinated substances, PFASs. The Swedish Chemicals Agency has been assigned to devise a national programme of measures for PFASs – a task which involves various projects and activities. This is an interim report for the assignment; the final report should be published in September 2017. The report describes the Swedish Chemicals Agency's overall strategy for working with PFASs. It also describes what the Swedish Chemicals Agency has done so far, what it is currently engaged in and its future plans as regards the national programme of measures.

The work was carried out in the Department of Development of Legislation and Other Instruments. The head of unit Ing-Marie Olsson Rössner is responsible for the assignment and the project group comprises of Karin Abrahamsson, Alicja Andersson, Daniel Borg, Inger Cederberg, Maria Delvin, Stellan Fischer, Stefan Gabring, Jan Hammar, Jenny Ivarsson (project leader), Anna Lindberg, Bert-Ove Lund and Gregory Moore.

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## Summary

PFASs (also termed *highly fluorinated substances*) have many desirable technical properties. They are water-, grease- and dirt-repellent, heat tolerant and film forming, which makes them useful in many applications. However, PFASs also have properties that enable them to cause a negative impact on the environment. They are extremely persistent and some are mobile in the environment. Moreover, many of them accumulate in living organisms (bioaccumulation) and have documented toxicity.

From a survey carried out in 2015 we estimate that there are over 3,000 PFASs on the global market. Only a few are registered under REACH. This is because PFASs are often used in low volumes therefore requiring only limited information under REACH. There is therefore reason to believe that unidentified PFASs are present in many chemical products on the Swedish market. PFASs can also enter Sweden and the EU *via* imported articles (such as textiles). Our survey shows that even though new PFASs are being developed at only a moderate rate, there is a substantial increase in areas of application in which existing PFASs are used in new ways.

The Swedish Chemicals Agency believes that the extreme persistence of PFASs is a cause for concern. This persistence means that PFASs released into the environment will remain there for the foreseeable future. In addition, many of them are water-soluble and mobile in soil which constitutes a risk of contamination of drinking water supplies for a long time. The lack of knowledge on how PFASs are used and their toxicity makes it difficult to estimate the degree of exposure and the risks that PFASs pose to humans and the environment. Therefore it is our opinion that PFASs should be assessed and managed broadly as a group.

Because of the potential negative effects of PFASs on the environment we believe that PFASs applications which could result in environmental contamination should be minimised and ultimately discontinued. To achieve this goal we have developed a strategy. An important part of our strategy is a wide-ranging collaboration with various authorities and other bodies in Sweden, the Nordic countries, the EU and globally. This will primarily be implemented within the framework of our existing networks.

We also intend to take the initiative amongst relevant Swedish authorities in publicly supporting a national programme of measures for PFASs. The existing network of government agencies dealing with PFASs are the National Food Agency, The Swedish Environmental Protection Agency, the Swedish Agency for Marine and Water Management, the Geological Survey of Sweden, the Swedish Geotechnical Institute, the Swedish Civil Contingencies Agency, the Surgeon General the County administrative boards.

We have divided PFASs into two main categories, which differ with regard to how the substances need to be managed so as to regulate or restrict them.

1. The first category consists of PFASs that fulfil the criteria for PBT or vPvB under REACH (i.e., the criteria for classification as persistent, bioaccumulative and toxic or the criteria for classification as very persistent and very bioaccumulative). This allows regulation within the EU and globally. Because of the large number of substances the best approach strategically is to manage PFASs in groups in which a lowest common denominator can be identified – i.e., they can be degraded to the same perfluorinated substance. One example of this is the pending EU restriction of PFOA, which also includes all substances that can be degraded to PFOA. Another example is the Swedish Chemicals Agency's collaboration with Germany in developing a restriction proposal in 2017 which we estimate will include several hundred PFASs.
2. The second category comprises of other PFASs, for which knowledge is substantially lacking. They have equal persistence to those PFASs in the first category but according to current test methods they do not bioaccumulate to the same extent and lack documented toxicity. It will take a longer time before we can determine how to manage these PFASs. During 2016 we will discuss, amongst other things, the possibilities in the EU how best to manage PFASs that are extremely persistent and mobile in the environment and, where it is relevant, globally within the OECD and the Stockholm Convention. It is particularly important that we collaborate with researchers with regard to these PFASs.

Our strategy places highest priority on those uses of PFASs that cause the greatest environmental contamination and which can therefore ultimately contaminate our drinking water. On the basis of our existing knowledge we have concluded that the most problematic end use is in fire-fighting foam and therefore earlier in 2016 we proposed national restrictions on the use of all PFASs in fire-fighting foam. In the current situation we do not envisage that we can similarly propose national regulations governing other uses. There is also widespread use of PFASs in the textile industry, but for textiles regulatory measures are required at an EU or global level as 90 percent of the textiles used in the EU are manufactured outside the EU. The pending PFOA restriction under REACH will encompass textiles, as will the Swedish Chemicals Agency's and Germany's pending restriction proposal for six similar PFASs (PFNA, PFDA, PFUnDA, PFDoDA, PFTTrDA, PFTeDA) and all PFASs that can be degraded to these substances.

An alternative approach to legislation could be through dialogue with companies which manufacture and use PFASs, with the aim of promoting voluntary substitution of PFASs. For example, it should be feasible to conduct a dialogue with sectors that manufacture and use food contact materials and with the textile sector.

For chemical products a greater requirement for reporting to the Swedish Products Register should provide more information on which PFASs are manufactured in

and imported into Sweden and in what quantities. We therefore intend to determine what this will require and to submit a proposal to the Government before the end of 2016.

A significant element in our strategy is to develop an action plan for PFASs within the EU where cooperation with other member states is important. We are focusing on being a driving force behind those activities at the EU level that we envisage will lead to political and regulatory strategies for preventing PFASs from causing health and environmental problems. For example, we are actively working with persistent substances that are included in the strategy of the 7<sup>th</sup> Environmental Action Programme for a non-toxic environment. The Swedish Chemicals Agency is also continuing its involvement in ECHA's (the European Chemicals Agency's) working group for PFASs and would like to see this work further strengthened.

As PFASs are transported across global borders *via* air, water and articles, global bans are needed to prevent the spread of these substances. Therefore, the Swedish Chemicals Agency is also working in the global arena. The Stockholm Convention, the global chemicals strategy (SAICM), and OECD are important forums for this work.

## Sammanfattning

PFAS (även kallade *högluorerade ämnen*) har många positiva tekniska egenskaper. De är vatten-, fett-, och smutsavstötande, värmetåliga och filmbildande, vilket gör dem användbara inom många områden. PFAS har dock flera egenskaper som är negativa för miljön. De är extremt svårnedbrytbara (persistenta) och vissa av dem är rörliga i miljön. Dessutom ansamlas flera av dem i levande organismer (bioackumulerande) och har dokumenterad giftighet (toxicitet).

I en kartläggning från 2015 uppskattar vi att över 3 000 PFAS finns på den globala marknaden. Bara ett fåtal är registrerade i Reach. Det beror på att PFAS oftast används i låga volymer och då är kraven på information låga i Reach. Det finns därför skäl att tro att PFAS förekommer i flera kemiska produkter på den svenska marknaden. PFAS kan också komma in i Sverige och EU via importerade varor (såsom textil). Vår kartläggning visar att även om utvecklingen av nya PFAS går i en måttlig takt så ser vi en kraftig ökning av användningsområden där befintliga PFAS används på nya sätt.

Kemikalieinspektionen anser att den extrema persistensen (svårnedbrytbarheten) hos PFAS utgör en anledning till oro. Deras persistens medför att PFAS som släpps ut i miljön kommer att finnas kvar där under överskådlig framtid. Vidare är många av dem vattenlösliga och rörliga i mark vilket utgör en risk för förorening av dricksvattentäkter för lång tid framöver. Den bristfälliga kunskapen om hur PFAS används och om ämnenas toxicitet (giftighet) gör det svårt att uppskatta vilken exponering och vilka risker PFAS innebär för människa och miljö. Vår bedömning är därför att PFAS bör bedömas och hanteras brett och samlat som grupp.

På grund av PFAS möjliga negativa miljöpåverkan anser vi att användningar av PFAS som kan ge upphov till förorening av miljön ska minimeras och på sikt upphöra. För att nå det målet har vi tagit fram en strategi där en viktig del är ett brett samarbete med olika myndigheter och andra aktörer – både i Sverige, i Norden, i EU och internationellt. Främst sker detta inom ramen för våra olika nätverk.

Vi avser även att ta initiativ till att berörda svenska myndigheter offentligt ställer sig bakom ett nationellt åtgärdsprogram för PFAS. Myndigheter som idag ingår i ett nätverk om PFAS är Livsmedelsverket, Naturvårdsverket, Havs- och vattenmyndigheten, Sveriges geologiska undersökning, Statens geotekniska institut, Myndigheten för samhällsskydd och beredskap, Generalläkaren och Länsstyrelserna.

Vi delar in PFAS i två olika huvudkategorier som behöver hanteras olika för att kunna regleras och begränsas.

1. Den första kategorin PFAS uppfyller kriterierna för PBT eller vPvB i Reach (dvs. kriterierna för att klassificeras som persistenta, bioackumulerande och toxiska eller kriterierna för att klassificeras som mycket persistenta och mycket bioackumulerande). Det möjliggör reglering inom EU och internationellt. På grund av det stora antalet ämnen är det strategiskt bästa sättet att hantera PFAS i grupper där man identifierat en minsta gemensamma nämnare – det vill säga att de kan brytas ner till samma perfluorerade ämne. Ett exempel på detta är den

kommande EU-begränsningen av PFOA som även inkluderar alla ämnen som kan brytas ner till PFOA. Ett annat exempel är Kemikalieinspektionens samarbete med Tyskland om att ta fram ett begränsningsförslag under 2017 som uppskattningsvis kommer att inkludera flera hundra PFAS.

2. Den andra kategorin består av övriga PFAS, där kunskapsbristen är stor. De är lika persistenta som de PFAS som ingår i den första kategorin men enligt dagens testmetoder bioackumuleras de inte i samma utsträckning och de har ingen dokumenterad toxicitet. För att hantera dessa PFAS behöver vi arbeta på lite längre sikt. Bland annat kommer vi under 2016 diskutera möjligheter för hur PFAS som är extremt persistenta och rörliga i miljön bäst bör hanteras inom EU och, där det är relevant, internationellt inom OECD och Stockholmskonventionen. För dessa PFAS är det särskilt viktigt att vi samverkar med forskare.

I vår strategi prioriterar vi först de användningar av PFAS som ger upphov till de största föroreningarna av miljön och som därmed i förlängningen kan förorena vårt dricksvatten. Utifrån befintlig kunskap har vi sett att den mest problematiska slutanvändningen är den i brandsläckningsskum och därför har vi tidigare under 2016 föreslagit nationella användningsbegränsningar för samtliga PFAS i brandsläckningsskum. För andra användningar ser vi i nuläget inte samma möjlighet att föreslå nationella regler. Även i textilindustrin är användningen av PFAS utbredd, men för textil krävs regulatoriska åtgärder på EU-nivå eller global nivå eftersom 90 procent av de textilier vi använder i EU tillverkas utanför EU. Den kommande PFOA-begränsningen i Reach kommer att omfatta textil, likaså Kemikalieinspektionens och Tysklands kommande begränsningsförslag för sex liknande PFAS (PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA) och alla PFAS som kan brytas ner till dessa.

Ett alternativ till lagstiftning kan vara dialog med företag som tillverkar och använder PFAS, med syfte att stimulera ett frivilligt utbyte av PFAS. Dialog skulle vara tänkbar till exempel med branscher som tillverkar och använder livsmedelsförpackningar och textilbranschen.

För kemiska produkter skulle ett ökat inrapporteringskrav till produktregistret ge oss mer information om vilka och i vilka mängder olika PFAS tillverkas i och importerar till Sverige. Därför avser vi utreda förutsättningarna för detta och lämna ett förslag till regeringen innan årsskiftet 2016/2017.

En viktig del i Kemikalieinspektionens strategi är att arbeta för en handlingsplan för PFAS inom EU där samarbete med andra medlemsländer är viktigt. Vi fokuserar på att vara pådrivande i de aktiviteter som pågår på EU-nivå som ska leda fram till politiska och regulatoriska strategier för att undvika att PFAS orsakar hälso- och miljöproblem. Vi är exempelvis aktiva i arbetet med persistenta ämnen som ingår i det sjunde miljöhandlingsprogrammets strategi för en giftfri miljö. Kemikalieinspektionen fortsätter även sitt engagemang i den Europeiska kemikaliemyndighetens (Echas) arbetsgrupp för PFAS och ser gärna att det arbetet stärks ytterligare.

Eftersom PFAS transporteras via luft, vatten och varor över internationella gränser behövs globala förbud om vi ska förhindra spridningen av dessa ämnen. Därför arbetar Kemikalieinspektionen även på den internationella arenan. Viktiga fora i det arbetet är Stockholmskonventionen, den globala kemikaliestrategin (SAICM) och OECD.

# 1 Introduction

Highly fluorinated substances (PFASs) is one of the focal areas for the Swedish Chemicals Agency's Government assignment for an action plan for a toxic-free everyday environment (Government Directive M2015/375/Ke). The assignment emphasises that the Swedish Chemicals Agency should establish a national programme of measures for PFASs. The programme would serve as an umbrella under which a variety of activities are being brought together. Some activities were part of the original assignment and others have been added by the Swedish Chemicals Agency. This is an interim report as part of the assignment; the final report should be published in September 2017.

The Swedish Chemicals Agency believes that uses of PFASs which could cause environmental pollution should be minimised and eventually discontinued.

We have realised that to achieve this goal we need to develop a strategy, which is presented in this report. An important part of the strategy is collaboration between various authorities and other bodies in different arenas – nationally, within the EU and globally.

In the report we also describe the activities we have carried out and those that are ongoing, as well as our future plans within the framework of the national programme of measures. We are also engaging in activities with other Swedish government agencies that are associated with the programme of measures.

## 2 Why do we need a strategy for PFASs?

Highly fluorinated substances, or per- and polyfluorinated alkyl substances (PFASs), are used because of their many desirable technical properties. They are grease-, dirt-, and water-repellent, heat tolerant and film forming. PFASs can therefore be used in many different articles and chemical products, for both professional use and for consumers. Moreover, only low concentrations are needed to achieve the desired effect. Product groups in which PFASs are known to be present include textiles, fire-fighting foam, and paper- and food-packaging. The Swedish Chemicals Agency's survey of the occurrence of PFASs and alternatives (Swedish Chemicals Agency 2015a) shows that these substances are widely used, including areas of application where there were previously less awareness of their use, such as cosmetics, dental restorative materials and smudge-repellents for mobile telephones. Restrictions on PFOS (perfluorooctane sulfonic acid) and PFOA (perfluorooctanoic acid) show that the industry has developed new PFASs as replacement substances. There are indications that these new PFASs not only serve as replacement substances for existing uses but are also starting being introduced into new areas of technology.

PFASs form an extensive substance group which can be divided into several sub-groups. The Government's chemicals proposition from 2013 (Government Offices 2013) states that there are hundreds of these substances. As part of the national programme of measures the Swedish Chemicals Agency has surveyed (which is

referred to above) the use of PFASs and concluded that over 3,000 substances are available on the global market. In addition, there are a large number of substances without a standardised identity number, which makes them difficult to identify. The existing system for categorising different PFAS groups is not designed to deal with today's multiplicity of PFASs as it does not address the need for an effective method of defining categories in work to impose restrictions. Up until now the potential hazard which a substance presents has been assessed by way of the substance's chain length however this approach is not appropriate for many new PFASs as they have more complex structures (branched, cyclic, polyethers, polymers, etc.). It is often difficult to identify and categorise a substance as a PFAS from its name alone. Polymers comprise the largest PFAS group and these polymers can in turn be divided into sub-groups. Polymers are for the most part exempt from the requirement to be registered under REACH.<sup>1</sup>

Our survey from 2015 shows that for over half of the substances there is no available information on how they are used. This is not surprising as many PFASs enter the EU and Sweden as imported articles, and to a large extent this importation is not subject to any inspection. Another reason for the lack of information is that many PFASs only need to be used at low concentrations subsequently triggering only low information requirement by REACH. In most cases the Swedish Products Register does not require that companies declare additive substances (e.g., PFASs) in chemical products that are used at concentrations below five percent.

What all PFASs have in common is that they consist of a hydrocarbon chain in which the hydrogen atoms are wholly or partly substituted by fluorine atoms. The carbon-fluorine bond is extremely strong, which means that PFASs are not degraded in the environment.<sup>2</sup> This is one reason why PFASs are found in the environment, in Sweden (Swedish Environmental Protection Agency 2016) and globally, for example, in Arctic environments far away from where these substances are manufactured or used (Butt et al. 2010). Moreover, some PFASs have been documented as toxic and bioaccumulative substances which can build up in animals and humans (Borg and Håkansson 2012). For some PFASs there is well-documented toxicity; for example PFOS and PFOA. But for most PFASs there is a lack of knowledge about their toxicity.

The Swedish Chemicals Agency believes that the extreme persistence (low degradability) of PFAS is a reason for concern. If these substances are not degraded in the environment they will remain in the environment for the foreseeable future. If PFASs in the future are shown to be more toxic than our current state of knowledge indicates or if levels of exposure increase, it will be difficult to deal with any possible risks to health or the environment. Moreover, the persistence of PFASs, plus the fact that many of them are water soluble and mobile in soil means that, for a long time to come, there will be a risk of contamination to sources of drinking water. The lack of knowledge about how PFAS are used and about the toxicity of

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<sup>1</sup> Polymers have to be registered if they contain 2 weight percent or more of monomers that are not themselves registered and if the amount of monomers is 1 tonne or more per year [article 2 (9) and 6 (3) under REACH]

<sup>2</sup> Polyfluorinated substances are degraded to persistent perfluorinated substances in the environment

these substances makes it difficult to estimate the degree of exposure and the risks that PFAS pose for humans and for the environment. Moreover, PFASs that are regulated are often replaced by other PFASs with similar properties. It is our opinion, therefore, that PFAS should be assessed and managed as a group, in a wide-ranging and comprehensive manner. PFASs can give rise to environmental contamination in association with various activities, such as manufacture, end use, recycling, waste management and sewage treatment. We see a need to reduce the exposure of humans to PFASs, for example, *via* drinking water, textiles, food contact materials and cosmetics.

### **3 The Swedish Chemicals Agency's strategy for reducing the use of PFASs**

Our strategy for PFASs involves a process that needs to be implemented in several stages and in different arenas: Sweden, the Nordic Countries, the EU and globally. This is described in this section. As PFASs make up a large group of substances, each of which poses potential hazards that are not entirely clear, we believe that PFASs should be divided into two categories that need to be managed differently for purposes of regulation or restriction. Therefore the two categories require different strategies.

- Category 1 comprises PFAS compounds which fulfil the PBT or vPvB criteria under REACH and/or the criteria of the Stockholm Convention which allow regulation within the EU and globally.
- Category 2 comprises other PFASs which are used to a significant extent but for which there is a lack of knowledge. More knowledge is needed for the PFASs in this category in order to regulate the substances in the EU and globally.

Table 1 describes what is included in the Swedish Chemicals Agency's PFAS strategy. PFASs impact on the areas of responsibility of various government agencies and collaboration with other agencies is therefore of central importance.

Table 1 Summary of the Swedish Chemicals Agency's strategy for the PFASs work

## **Our PFASs strategy**

***The Swedish Chemicals Agency believes that uses of PFASs that could cause environmental pollution should be minimised and eventually discontinued. To achieve this a broad collaboration is required between various agencies and other bodies.***

### ***The Swedish Chemicals Agency:***

- works in collaboration with Swedish government agencies and other bodies – principally by being the driving force behind those networks we have been involved in and have initiated, so as to disseminate knowledge and coordinate issues concerning PFASs.
- aims to take the initiative in urging relevant Swedish government agencies to publicly support a national programme of measures. Those government agencies currently involved in a PFAS network are the National Food Agency, the Swedish Environmental Protection Agency, the Swedish Agency for Marine and Water Management, the Geological Survey of Sweden, the Swedish Geotechnical Institute, the Swedish Civil Contingencies Agency, the Surgeon General and the County Administrative Boards.
- cooperates with other countries in the EU and the Nordic countries – particularly Germany, Denmark and Norway – to make measures more effective on national and EU levels and to create an EU action plan.
- works for an increase in environmental monitoring of PFASs in the EU.

## **Strategy for PFASs-category 1**

### ***The Swedish Chemicals Agency:***

- is working towards the regulation of PFASs under the REACH- and CLP-regulations:
  - we have submitted proposals for harmonised classification and SVHC (candidate listing) for perfluorononanoic acid (PFNA) and perfluorodecanoic acid (PFDA)
  - in 2017 we will submit a proposal for SVHC for perfluorohexane sulfonic acid (PFHxS)
  - in collaboration with Germany we are developing a proposal to restrict a group of PFAS compounds which comprises around several hundred different PFASs.
- continues to play an active role in the European Chemicals Agency's (ECHA's) PFAS network which will develop a work plan for PFASs.

- is working for an updated strategy for PFOS in collaboration with the Swedish Environmental Protection Agency in its Government assignment for the National Implementation Plan for the Stockholm Convention.

***The Swedish Chemicals Agency proposes that the Government:***

- works for the promptest removal of exemptions for the use of PFOS under the POPs regulation and under the Stockholm Convention.
- works for additional PFASs, for example, PFHxS, to be nominated for listing under the Stockholm Convention by the European Commission or by a country outside the EU.

## **Strategy for PFASs-category 2**

***The Swedish Chemicals Agency:***

- is establishing in 2016 the prerequisites for raising the requirements for reporting PFASs to the Swedish Products Register. Proposal should be submitted before the end of 2016.
- is investigating how best to manage PFASs that are very persistent (vP) and mobile in the environment [but which according to our current level of knowledge do not fulfil the criteria for bioaccumulation (B) and toxicity (T)] in the EU and, where it is relevant, also globally within the OECD and under the Stockholm Convention.
- is contributing to the European Commission's sub-strategy for persistent substances which is part of the 7th Environment Action Programme's strategy for a non-toxic environment.
- is prioritising PFASs on the basis of knowledge generated by REACH's registration of low-volume substances (2018).
- is collaborating with researchers in their work to develop
  - analytical methods for detecting and determining the concentrations of PFASs in the environment and in chemical products and articles
  - better methods for assessing the properties of PFAS that might affect health and the environment.

***The Swedish Chemicals Agency proposes that the Government:***

- endeavours to continue the global chemicals strategy (SAICM) in a determined and ambitious manner after 2020.
- is promoting discussions within the EU and globally about a future global framework for those substances which demand global measures but which do not fulfil the criteria for the Stockholm Convention, for example, PFASs.

## **Strategy for different uses (applies to both categories 1 and 2)**

### ***The Swedish Chemicals Agency:***

- is prioritising the implementation of measures for those uses which we know result in substantial direct release into the environment.
- has brought forward a proposal for national restrictions on fire-fighting foams and in 2016 is investing in training and information aimed at the fire service.
- is holding discussions with the National Food Agency about conducting a dialogue with manufacturers and importers of food contact materials, with the aim of encouraging a voluntary replacement of PFASs.

### ***The Swedish Chemicals Agency proposes that the Government:***

- if restrictions on fire-fighting foam are introduced, carries out the first review of the restriction in 2019 with the aim of reducing the number of exemptions as far as possible.
- is facilitating a bilateral collaboration with any country which exports substantial quantities of articles to Sweden (for example, textiles) by increased allocations to the Swedish Chemicals Agency (budget report 2017-2019). This should also be relevant to PFASs.

The following page (Figure 1) shows the various parties we consider engaging within our PFASs work in the different arenas (Sweden, the Nordic countries, the EU and globally). As mentioned above, we are collaborating with other government agencies. Another important part of our strategy is to meet with companies and trade associations in the various arenas because they possess valuable knowledge and experience. Table 2 shows a timeline for activities in the various arenas where the Swedish Chemicals Agency is involved.

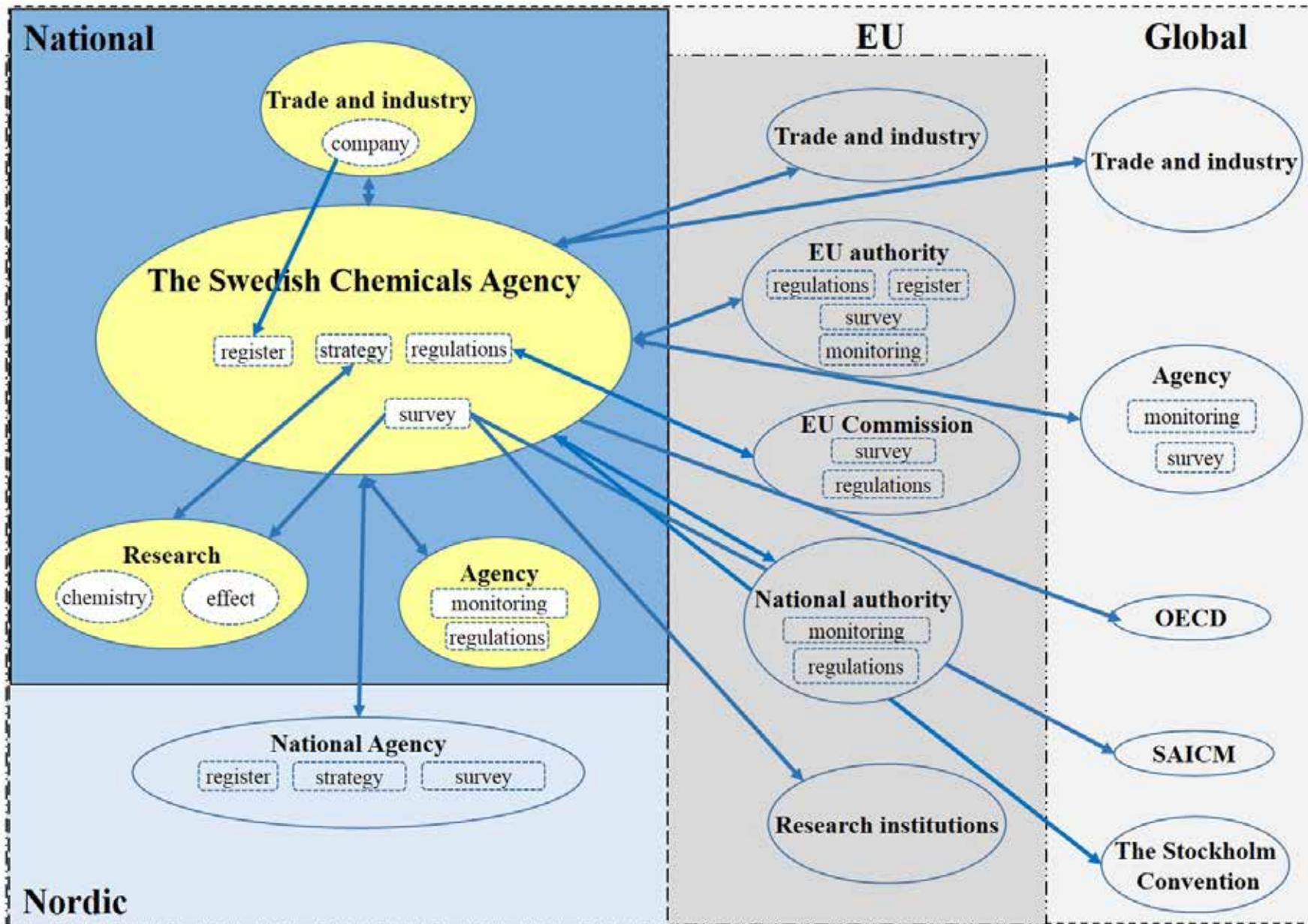


Figure 1 Overview of the various PFAS-related communication between the Swedish Chemicals Agency and different national - EU - global bodies which are involved in working with our strategy for PFASs

Table 2 Different arenas for the Swedish Chemicals Agency's work with PFASs

ARENA	2016	2017	2018	>2018
<b>National</b>	<p>National programme of measures –develop and establish</p> <p>Fire-fighting foam – proposals for restrictions. Step 1 - with certain exemptions</p> <p>Examination of expanded requirements for reporting to the Swedish Products Register</p>	<p>National programme of measures– in place</p> <p>Prospective implementation of expanded requirement for reporting to the Swedish Products Register</p>		<p>Fire-fighting foam – proposals for restrictions. Step 2 - minimise exemptions</p>
<b>Nordic</b>	<p>Analysis of total organic fluorine (TOF) in consumer articles</p>	<p>Publication of a report on TOF-analyses of PFASs in consumer articles</p> <p>Organising a Nordic/EU workshop on an EU action plan for PFASs</p>	<p>Continues to promote the PFAS issue in the Nordic Risk Assessment Project (NORAP) - project group under the Nordic Chemical Group (NKG)</p>	<p>Continues to promote the PFASs issue in the Nordic Risk Assessment Project (NORAP) - project group under the Nordic Chemical Group (NKG)</p>
<b>The EU</b>	<p>Preparatory work - restriction proposals for C9-C14 PFASs</p> <p>Development of sub-strategy for persistent substances within the framework of the EU's strategy for a non-toxic environment.</p> <p>ECHA's PFAS group is developing a joint work plan for managing PFASs under REACH and CLP</p> <p>Publication of the Swedish survey of PFASs in 2015 in <i>NORMAN bulletin of emerging substances</i>, a news medium for environmental agencies working in the area of risk management/monitoring of chemicals</p>	<p>Restriction proposals for C9-C14 PFASs</p> <p>Development of sub-strategy for persistent substances within the framework of the EU's strategy for a non-toxic environment.</p> <p>Work within REACH and CLP based on the action plan developed in ECHA's PFAS group</p> <p>Organising a Nordic/EU workshop on an EU action plan for PFASs</p>	<p>Submitting restriction proposals for C9-C14 PFASs</p> <p>Development of sub-strategy for persistent substances within the framework of the EU's strategy for a non-toxic environment.</p> <p>Prioritising work with PFASs on the basis of knowledge generated by low-volume substances under REACH registration</p>	<p>Prioritising work with PFASs on the basis of knowledge generated by low-volume substances under REACH registration</p>
<b>Internationally</b>	<p>The Stockholm Convention's expert committee is preparing a review on PFOS alternatives</p> <p>OECD task force exposure</p>	<p>The Conference of the Parties to the Stockholm Convention as well as discussions on PFOS alternatives and on the interpretation of the duration of agreed exemptions</p> <p>OECD task force exposure</p>	<p>Prospective EU nomination of PFHxS to the Stockholm Convention</p> <p>OECD task force exposure</p>	<p>A continuation of the global chemicals strategy, SAICM (after 2020)</p> <p>The Stockholm Convention will decide on the global phasing out of PFOA at the Conference of the Parties to the Stockholm Convention in 2019</p> <p>OECD task force exposure</p>

### 3.1 Work at the national level

With the term "use" we refer to the entire life-cycle of PFASs. There are various phases in the life-cycle that can result in release and exposure of humans and the environment. The first is the manufacture of the substance itself, after which there are various processing stages in which the substance may be used (such as process chemicals in the manufacture of polymers and in the formulation of chemical products, for example, fire-fighting foam). The end use concerns the ultimate use of a chemical, after which the next stage in the use chain is the waste phase. One example of an end use of PFASs is in jackets used by consumers. An important part of the life-cycle is the waste phase. Bearing in mind that all PFASs (the substances themselves or their degradation products) are very persistent, the waste may be significant in terms of exposure. Incineration at high temperatures (at least 1,100°C) generally degrades PFAS to carbon dioxide and hydrogen fluoride (UNEP 2012). However, it is not known what is produced at lower incineration temperatures.

We will prioritise those areas of use which cause the greatest environmental contamination by PFASs. Based on the knowledge we have, we believe that the most problematic end use is in fire-fighting foam. Groundwater and drinking water have been contaminated at several locations in Sweden as a result of using fire-fighting foam containing PFASs and we have therefore proposed restrictions on how PFAS-containing fire-fighting foam is used in Sweden. Even though we attribute identified risks to PFASs in category 1 (i.e., those which fulfil the PBT/vPvB criteria) we believe that PFASs in category 2 contribute to the overall risk scenario. Our restrictions proposal therefore includes all PFASs. In 2016 we are also working with other measures such as investing in management training in the rescue services in collaboration with the Swedish Civil Contingencies Agency.

In the current situation we do not foresee the same possibilities for proposing national regulations in other areas of use but we are discussing a possible collaboration with the National Food Agency to discuss with manufacturers and importers of food contact materials the our aim to promote voluntary substitution of PFASs.

With regard to chemical products an expanded reporting requirement for the Swedish Products Register should generate more information on which PFASs are manufactured in and imported into Sweden and in what quantities. We therefore intend to determine what this will require and to submit a proposal to the Government before the end of 2016.

The risk of PFASs contaminating crude water and drinking water falls within the areas of responsibility of several government agencies, therefore collaboration with other government agencies is of central importance in the Swedish Chemicals Agency's strategy. The work mainly takes place within the national networks in which we are participating and which we initiated.

In his study (Government Offices 2016) Göran Enander pointed out that a lack of collaboration between the responsible government agencies was an important reason why it took such a long time before the contamination of drinking water in Sweden was discovered. After what occurred in Kallinge and several other municipalities, the Swedish Chemicals Agency together with the National Food Agency created a network to consolidate on a national level all the knowledge and experience within the country. We are also involved in a government agencies network together with the National Food Agency, the Swedish Environmental Protection Agency, the Swedish Agency for Marine and Water Management, the Geological Survey of Sweden (SGU), the Swedish Geotechnical Institute, the Swedish Civil Contingencies Agency, the Surgeon General and the County Administrative Boards in

order to better coordinate dealing with the PFAS issue. The Swedish Chemicals Agency intends to work towards government agencies adopting a clear united stance for establishing a national programme of measures.

### **3.1.1 Research collaboration**

The significant lack of knowledge concerning the inherent properties of PFASs makes it especially important to have close contacts with research institutions and research networks. Researchers require to know what types of PFASs are available on the market and what new PFASs are being brought onto the market as substitution substances. The extreme properties of PFASs make it difficult, sometimes impossible, to assess and manage these substances using established methods. It is a challenge for researchers in both environmental chemistry and toxicology/ecotoxicology. Government agencies need help from researchers to enable them to revise their assessment methods. In Sweden there is considerable research expertise in the area of PFASs, particularly with regard to environmental chemistry. This is an important resource for developing methods to quantify the different environmental properties of PFASs. Close contacts with researchers are necessary for staying in touch with the latest knowledge in the area of PFASs.

Some ecotoxicological and epidemiological research on PFASs is being conducted in Sweden, but only a small amount of toxicological research. The acquisition and presentation of new toxicological data, above all for "new" PFASs, is mostly taking place in the manufacturing industry, and to a lesser degree in research.

The Swedish Chemicals Agency's survey (Swedish Chemicals Agency 2015a) shows it is difficult to find alternatives that have the same desirable properties as PFASs. There is also a need for technological development to facilitate a reduction in the use of PFASs and, to achieve this, the collaboration of other parties is required. SUPFES (2015), a project funded by the Swedish Research Council Formas, is one example of collaboration between researchers and industry to find alternatives that can replace harmful PFASs in textiles. The Swedish Chemicals Agency participates in the project's reference group.

Another example of research collaboration is our involvement in the reference group for a project that aims to study the possible effect on the health of citizens in Ronneby where drinking water was contaminated by PFASs.

### **3.1.2 Recycling and waste**

To increase the possibilities for recycling, waste management operations need to obtain information on the PFAS content of different articles. Increased requirements for reporting to the Swedish Products Register should make it easier to find information on which PFASs are used in chemical products in Sweden. Increased reporting could also generate information on PFASs in nationally produced articles and the information could thereby also reach waste management and recycling operations. One area where this would be particularly valuable is textiles (e.g., if textile impregnation is taking place in Sweden).

The Swedish Environmental Protection Agency shows in its screening from 2016 (Swedish Environmental Protection Agency 2016) that leachate from landfills may be an important source of PFASs in the environment. To determine how extensive this problem is the Swedish Chemicals Agency is calling for more studies of PFAS occurrence associated with landfills.

We will also strive to ensure that current waste incineration actually degrades PFAS molecules completely.

### **3.2 Work at the Nordic level**

The Swedish Chemicals Agency is involved in the Nordic Risk Assessment Project (NORAP<sup>3</sup>), a project group under the Nordic Chemical Group (NKG) which is part of the Nordic Council of Ministers for the Environment. Within NORAP the Nordic countries exchange information and knowledge about hazard- and risk-assessment as well as risk management for chemicals, including PFASs. The Swedish Chemicals Agency is planning to host and together with the other Nordic countries organise a workshop in 2017, on an EU action plan for PFASs. We have also initiated a special collaboration with Denmark (the Danish Environmental Protection Agency) and Norway (the Norwegian Environment Agency) concerning PFASs.

### **3.3 Work at the EU level**

An important part of the Swedish Chemicals Agency's PFAS strategy is to work towards an EU action plan. We are focusing on being active at the EU level in those activities that will lead on to political and regulatory strategies for avoiding environmental problems caused by PFASs. For example, we will submit documents for the sub-strategy for persistent substances which is part of the strategy of the 7th Environment Action Programme for a non-toxic environment. The Swedish Chemicals Agency is continuing its commitments within ECHA's working group for PFASs and wants to strengthen ECHA's PFAS work. We shall therefore assess whether the work to regulate PFASs under the REACH and CLP regulations would succeed in acquiring greater political weight.

Collaboration with other member states is of central importance to our work for an EU action plan. The Swedish Chemicals Agency has a special collaborative agreement for PFASs with the Danish Environmental Protection Agency and we have also initiated collaboration with the German Federal Environment Agency.

We believe that the REACH- and CLP-regulations are the two foremost instruments for regulating the use of other PFASs in the EU. The Swedish Chemicals Agency has submitted several classification and SVHC proposals<sup>4</sup> and is collaborating with Germany on an EU restriction for a number of PFAS groups. The restriction proposal will include around several hundred PFASs. In addition, the REACH registration in 2018 for low-volume substances could help us to prioritise the PFASs that are used in the largest volumes and those uses that have the greatest potential to result in release and exposure. We intend to use the knowledge generated by the REACH registration in 2018, possibly to regulate more PFASs under REACH.

Large amounts of PFASs are used in the textile industry. Measures are needed at EU and global levels to regulate use because 90 percent of the textiles we use are manufactured outside of the EU. An important consideration is that those PFASs that are used in textiles are mostly polymers, which in many cases are exempt from the registration requirement under REACH. The PFOA restriction under REACH, which is being prepared in the EU, will include textiles, certain polymers, etc., as will the restriction proposals that the Swedish Chemicals Agency will put forward in collaboration with Germany.

With regard to environmental monitoring, we intend to disseminate information to the member states about where they can expect to find contaminated areas, such as drinking water sources close to fire training sites. The idea is that this will encourage increased national

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<sup>3</sup> Nordic Risk Assessment Project

<sup>4</sup> SVHC (substances of very high concern) for candidate listing under REACH

monitoring so that we can obtain a better overview of the contamination situation in Europe. To aid this process we are also distributing our survey on the occurrence of PFASs on the world market (Swedish Chemicals Agency 2015a). When several member states become aware that their environments have also been adversely affected it will probably be easier to gain support and complete proposals for increased regulation of PFASs at an EU level.

### **3.3.1 REACH needs to be developed**

REACH requires further development – a matter which the Swedish Chemicals Agency has pointed out in previous reports (Swedish Chemicals Agency 2012 and 2014).

Development areas that are particularly relevant to PFASs are

- Improvement in hazard- and risk-assessment of *groups of substances*, which should facilitate the regulation of PFAS groups. All PFASs have in common the fact that they are extremely persistent (the original substances or their degradation products). This makes the group very special, particularly with regard to the difficulties of surveying risks in the long term. Moreover, many PFASs are mobile – which means that they are readily redistributed when they enter the environment. Unregulated use of these substances therefore poses a potential problem for our ground-, surface- and drinking-water. The Swedish Chemicals Agency therefore intends in autumn 2016 to discuss the best ways of dealing with PFASs that are very persistent (vP) and mobile in the environment - but which, given current knowledge, do not fulfil the criteria for bioaccumulation (B) and toxicity (T) - in the EU and, where relevant, globally within the OECD and under the Stockholm Convention.
- REACH was not developed to regulate *chemical substances in articles*. As the majority of the articles consumed in the EU are manufactured outside the EU, the substances present in articles are not registered under REACH. If the substance is placed on the candidate list it is subject to an information requirement, but the limit is 0.1 percent and PFASs are often present only at lower concentrations than this. However, if it were possible to restrict all PFASs in accordance with REACH, the restriction would apply to all articles including those imported but the restriction process is very time consuming and resource intensive. The Swedish Chemicals Agency has been active in the work of the European Commission to improve the efficiency of the restriction process (Restriction Efficiency Task Force, RETF). The European Commission, ECHA and member states are now working to implement the recommendations put forward by RETF. However, it is unclear to what extent the restriction process will be improved in practice.
- The Swedish Chemicals Agency's survey from 2015 shows that *polymers* comprise the largest PFAS group and these polymers can in turn be divided into sub-groups. Polymers are in most cases exempt from the requirement to be registered under REACH. Research needs to be carried out into whether the current interpretation of the REACH regulations for polymers can be made more flexible in order that more information can be acquired on the use of polymers in society.

### **3.3.2 Other EU legislation**

The use of PFOS is controlled by the POPs regulation (850/2004) which is the EU's tool for dealing with those substances listed under the global Stockholm Convention and within the regional POPs protocol under the Convention on Long-range Transboundary Air Pollution (CLRTAP). However, there are a range of exemptions. The largest quantities of PFOSs are

used in the metal industry. We believe that Sweden should work to remove these exemptions as soon as possible.

As many PFASs are mainly spread *via* water it is important that the EU's Water Framework Directive (Directive 2000/60/EC) is followed. Since 2015 those parts of the directive that concern groundwater have been strengthened, which has meant an increase in the activities of various working groups. The Swedish Chemicals Agency intends to motivate Swedish governmental ministries and agencies to move PFAS-related matters forward, especially in the areas of ground-, surface- and drinking-water.

The idea of a specific PFAS regulation within the EU has been put forward in order to rectify the shortcomings in REACH which we have identified. At present, however, it is difficult to implement such a solution politically. It has proved difficult to agree on particular strategies for, for example, endocrine-disrupting substances and nanomaterials. With regard to PFASs we believe that a further development of REACH is the best way forward.

### **3.3.3 Recycling and waste**

We have previously proposed that the information requirement under REACH should include all hazardous substances and that the information should be made available to anyone who might be affected during the entire life-cycle of an article, including the waste phase (Swedish Chemicals Agency 2014). This should enable the information to reach waste management and recycling services as well. One area in which this should be particularly useful is textiles.

## **3.4 Work on the global level**

One cannot assume that EU legislation will set the standard for the rest of the world in the future. This will mean an increased need for global negotiations in order to come up with joint solutions. PFASs are transported over global borders *via* air, water and articles. A global ban is therefore needed if we are to prevent the spread of these substances. The global arena is therefore important in the Swedish Chemicals Agency's work. Our participation in the Stockholm Convention, the global chemical strategy (SAICM<sup>5</sup>) and the OECD are of major importance.

It was Sweden that nominated PFOS and about one hundred substances that can be degraded to PFOS to the Stockholm Convention in 2005. The Swedish Chemicals Agency has proposed that the European Commission nominates PFHxS to the Stockholm Convention, and we will follow this up.

Efforts are also required on a political level to motivate the regulation of PFASs globally. The Swedish Chemicals Agency considers that the Government should work to:

- remove those exemptions for PFOS under the Stockholm Convention in areas of application where alternatives are available, for example, fire-fighting foam.
- encouraging the European Commission or a country outside the EU to nominate additional PFASs, for example, PFHxS, to the Stockholm Convention, and ensure that the management of a substance under REACH should not be used as a reason to prevent it being nominated to the Stockholm Convention.

In the global chemical strategy, SAICM, Sweden has supported work to develop a programme as well as guidance for improving information on chemicals in articles which will apply throughout the article's entire life-cycle. Better information on PFASs in articles would also

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<sup>5</sup> The Strategic Approach to International Chemicals Management

be desirable. We consider it important that Sweden continues to strive for the implementation of the programme.

We consider that the Government should work for a continuation of SAICM after 2020 and for opening up the possibility of a future global framework for substances which require global measures, for example, PFASs, if they do not fulfil the Stockholm Convention's criteria.

Dialogue with trade and industry can be one measure for risk reduction in the global arena. For example, government agencies supporting companies in their efforts to replace hazardous substances without having to wait for the introduction of stringent regulations into the legislation. This should be beneficial for Sweden and the EU as the majority of the articles we consume are manufactured in countries outside the EU. Release into the environment can also take place during manufacture, which has an adverse effect on the country of manufacture and, in the longer term, also on other parts of the world through atmospheric precipitation. Dialogue can be effective in raising awareness of the PFAS problem amongst the parties involved. The role of government agencies is to work for substitution and/or a reduction in incorrect usage and to help companies make an informed choice of what substances to use. The Swedish Chemicals Agency proposes in the budget report 2017-2019 that we could enter into a bilateral collaboration on three levels (political, government agencies, and companies) with strategic countries which export substantial quantities of articles to Sweden. This would build on a parallel national trade and industry dialogue (e.g., textiles). We believe that such an investment would reduce the risk of future contamination by PFASs.

## **4 Activities within the national programme of measures for PFASs**

In this section we describe the various projects in the Swedish Chemicals Agency's work with the national programme of measures for PFASs. We have reported on some of these to the Government, while others are in progress or at the planning stage. Examples of activities amongst other Swedish government agencies that are associated with the national programme of measures are briefly described in section 4.5.

We want our work with PFASs in part to increase knowledge of PFASs and in part to reduce their use.

### **4.1 Networks**

The problems with PFASs, in the first instance is that the contamination of ground-, surface- and drinking-water is so complex that it has been necessary to strengthen collaboration between the different bodies in society by creating various networks. We have therefore initiated a national PFAS network together with the National Food Agency and have also created a network between different Swedish Government agencies that are responsible. The need for better collaboration between government agencies is a point which Göran Enander also highlighted in his study on PFAS contaminants in drinking water (Government Offices 2016). We are also involved at an EU level in a network run by ECHA.

#### **4.1.1 National PFAS networks**

Since spring 2014 two meetings have been held each year in which any party affected by PFASs can participate, such as government agencies, researchers, water suppliers,

consultants, municipalities and county administrative boards. The aim is to increase knowledge about how PFASs have spread into the environment, where contaminated areas can be found, and potential solutions such as water treatment and remediation. There are many researchers and consultants in Sweden who are in possession of important knowledge and the network serves as a platform for an exchange of experience while at the same time enabling the identification of sources of knowledge and the need for research and technological development. Until now the focus has been on those problems associated with previous use of PFOS-based fire-fighting foam and contamination of ground-, surface- and drinking-water.

#### **4.1.2 Government agencies network**

As the problems we have encountered so far impact on the areas of responsibility of many different government agencies there has been an urgent need to also have better collaboration between these government agencies. Since autumn 2014 the government agencies concerned have met several times to coordinate activities and improve the dissemination of information to society. This network, which is growing, currently includes the Swedish Chemicals Agency, the National Food Agency, the Swedish Environmental Protection Agency, the Geological Survey of Sweden, the Swedish Geotechnical Institute, the Swedish Civil Contingencies Agency, the Swedish Agency for Marine and Water Management, the Surgeon General, and the County Administrative Boards. The government agencies have jointly produced a guide which describes the division of responsibilities between government agencies and gives advice on where information on various PFAS-related issues can be found. The guide is published on the Swedish Chemicals Agency's website.

#### **4.1.3 EU network**

Six member states (Sweden, Germany, Denmark, the Netherlands, Belgium, Austria) and Norway and also the European Chemicals Agency (ECHA) are collaborating under the REACH- and CLP-regulations in expanding knowledge about which PFASs are used, what their properties are, the need for greater knowledge of their harmful effects, and the need to regulate them. The EU network is described in greater detail in section 4.3.1.2.

## **4.2 Activities already carried out**

### **4.2.1 Survey of the occurrence and use of PFASs and alternatives**

The Swedish Chemicals Agency surveyed the occurrence and use of PFASs and alternatives in spring 2015. This was presented in the form of a report in June 2015 (Swedish Chemicals Agency 2015a).

The results of the survey show that there are probably more than 3,000 commercial PFASs in circulation on the world market. The largest group comprises of polymers. Many of the substances are of technical grade with more or less unspecified compositions. We observe that industry has switched to substances based on shorter carbon chains, particularly those comprising six perfluorinated carbon atoms. Other examples of PFASs that are becoming ever more common are those that have an oxygen atom between certain carbon atoms.

Information from various patents indicates a strong growth in the use of existing substances in new areas of technology. Furthermore, the development of new PFASs seems to be proceeding at a more moderate pace. The survey shows that PFASs already have a broad range of applications, from better known uses such as fire-fighting foam, textiles and food

contact materials to less studied applications such as cosmetics, dental restorative materials and smudge-proof surface treatments for smart phones.

However, the survey did not give a comprehensive picture because of a significant lack of available information. Only for a small number of substances has it been possible to obtain information on the amounts of PFASs that are being used. Moreover, for half the identified substances there is a lack of information on use. This is not surprising. Many PFASs enter the EU and Sweden *via* the importation of articles, for example, textiles, and this is not subject to any inspection procedure. Another reason for the lack of information is that reporting requirements under REACH regulation only fully apply for amounts that are higher than occur for this substance group. Most PFASs are highly effective and are therefore used at low concentrations. In addition, the Swedish registration requirement for chemical products is inadequate for picking up PFASs. In most cases, substances at concentrations below five percent are not required to be reported to the Swedish Products Register. PFASs are often used at concentrations below five percent.

Those alternatives to PFASs that we have identified comprise fluorine-free substances, alternative choices of materials, and alternative technologies. Alternatives were primarily found for textile and fire-fighting foam applications. It is generally difficult to find alternatives that match PFASs with respect to desirable properties, which illustrates the need for technological development. It also shows that unnecessary overuse needs to be discouraged.

The survey has been and remains an important tool in the work to reduce further health and environmental problems with PFASs. As the development of PFASs and the market for PFASs and PFAS products is going through a dynamic period the survey will need to be updated. This should be complemented with increased environmental monitoring, including an annual screening.

## **4.2.2 Measures for fire-fighting foam**

### **4.2.2.1 National regulations**

In the report from the assignment for national regulations for PFASs in fire-fighting foam we proposed a legal requirement for the collection and destruction of fluorine-based fire-fighting foam after being used as of 1 January 2017 (Swedish Chemicals Agency 2016). The requirement was proposed with the support of the Swedish Environmental Code. We proposed a number of specific exemptions from requirement for collection and destruction and proposed that the Government should carry out the first review in 2019 with the aim of reducing the number of exemption as much as possible. In the report we also stated that the Swedish Chemicals Agency will, in collaboration with the Swedish Civil Contingencies Agency, if this is deemed to be appropriate and feasible, bring forward a proposal concerning the reporting requirement in order to support the proposed review. It may therefore be necessary to examine how the information is gathered.

All PFASs are extremely persistent and will remain in the environment for a long time. The spread of fire-fighting foam which contains PFASs therefore needs to be reduced so as to avoid risking the future contamination of drinking water. The Swedish Environmental Protection Agency also observes in its report (Swedish Environmental Protection Agency 2016) that the use of PFAS-containing fire-fighting foam for training and accidental fires is

the major source of spread into the Swedish environment over time. A review of exemptions is therefore important to improve regulations, as proposed by the Swedish Chemicals Agency.

#### **4.2.2.2 Training**

To prevent the incorrect use of fire-fighting foam (class-B foam), which generally contains PFASs, the Swedish Chemicals Agency, together with the Swedish Civil Contingencies Agency, has begun investing in training and information provision for municipal rescue services. This work is continuing in 2016 as we, together with the Swedish Civil Contingencies Agency, the Swedish Environmental Protection Agency, the Swedish Fire Protection Association and Örebro University, plan to hold a seminar directed at fire chiefs in municipal rescue services. The seminar is intended to offer the Rescue Services tools for extinguishing fires in a manner that minimises any impact on the environment. One point on the agenda will be recommendations for and information about regulations governing the use of foam. The Swedish Chemicals Agency, the Swedish Civil Contingencies Agency and the Swedish Environmental Protection Agency have also produced a joint brochure of recommendations for reducing the use of fire-fighting foam.

#### **4.2.2.3 Dealing with old portable fire extinguishers**

We see a need to inform consumers of the importance of dealing with portable fire extinguishers that have passed their expiration date in an environmentally correct manner. This can be done by taking them to recycling centres (provided they accept such products). To disseminate this information (besides publishing it on our own website) we have collaborated with the Swedish Association of Local Authorities and Regions to contact municipalities (and county councils). We also have contacts with the Swedish Consumer Agency which allow us to distribute information through their channels. *Håll Sverige Rent* (the Keep Sweden Tidy Foundation) has included the recommendation in a series of lessons for years 4-9. As it can be difficult for a consumer to know whether a portable fire extinguisher contains powder or foam, all used portable fire extinguishers should be regarded as environmentally hazardous waste.

The Swedish Chemicals Agency has contacted the trade and industry organisation SVEBRA<sup>6</sup> (Presto 2016) and stated the need for labelling on portable fire extinguishers which tells consumers whether the fire extinguisher should be taken to a recycling centre when it has been used (if there is no specified agreement that it should be dealt with and replaced by the supplier).

### **4.3 Ongoing activities**

#### **4.3.1 EU action plan**

The Swedish Chemicals Agency has been assigned by the Government to work for the adoption of an action plan for PFASs at an EU level. The assignment is described in general terms as "The Swedish Chemicals Agency shall work for an action plan for highly fluorinated substances to be initiated within the EU" (Government Directive M2015/375/Ke). A more detailed description of the action plan's content can be found in the Government's Chemical Proposition from 2013 (Government Offices 2013) and specifies:

"An action plan for PFASs should be established within the EU. The action plan should consist of:

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<sup>6</sup> Svenska Brandsäkerhetsföretag

1. the need for research into the substance group,
2. development of methodology for enabling risk assessment of the substances in the group,
3. the need for environmental monitoring and
4. proposals for how today's regulations governing chemicals and articles can be modified to achieve the desired reduction for the entire group”.

The Swedish Chemicals Agency's interpretation is that the fundamental goal of an EU action plan is to reduce exposure (for humans and the environment) to PFASs.

#### **4.3.1.1 PFASs from an overall perspective**

PFASs are found everywhere in the environment and also in humans and animals. As PFASs are highly effective substances with desirable technical properties they are used in many chemical products and articles, though at low concentrations. This explains the common occurrence of PFASs in the environment and in living organisms. However, because of the lack of information on how and where PFASs are used, it is to a large extent unclear what the sources are from which they spread. Also, the volumes of PFASs used are unknown.

Despite the diffuse spreading due to the large number of sources, it has been possible to link the presence of PFASs with particular locations. This has mainly concerned fire training locations where the release of PFASs from fire-fighting foam has been observed.

From an overall perspective, therefore, a reduction or elimination of exposure to PFASs should involve the following:

- (i) Restriction of future use of PFASs in chemical products and articles. This can be achieved with the help of relevant legislation, above all REACH and the different product directives, but also through other legislation, such as the Regulation on cosmetic products and food legislation, which can regulate the use of PFASs in these products.
- (ii) Reduction or elimination of the current exposure to PFASs by:
  - a. rational recycling (for example, textiles) and waste management for chemical products and articles containing PFASs
  - b. reduction or elimination of human exposure to PFASs via a contaminated environment (e.g., food, drinking water).

The Government's assignment to the Swedish Chemicals Agency for an EU action plan focuses, in our opinion, on activities mainly intended to restrict the use of PFASs in the future, that is point (i) above.

#### **4.3.1.2 Ongoing activities at an EU level**

Described below are two ongoing activities at an EU level which are aimed at creating political and regulatory strategies for solutions concerning PFASs.

##### ***EU's 7th Environmental Action Programme, EAP***

The plan was accepted in 2013. A strategy is being developed under priority goal 3 for a non-toxic environment and it is expected to be completed before 2018. In 2015 the European Commission (Environment Directorate General) announced a tendering for the procurement of a strategy for a non-toxic environment. In the material for the tendering process the Commission named seven focal areas as components of the proposed strategy for a non-toxic environment. One of these focal areas was a sub-strategy for persistent substances, which should of course include PFASs.

The first discussion about the sub-strategy took place in June 2016 at a workshop ("Strategy for a non-toxic environment") at which the Commission's consultant presented their first thoughts about the sub-strategy.

### ***ECHA's informal working group for PFASs***

The group has been working since May 2014 with setting goals for coordinating the work with PFASs for different member states, primarily within the framework of REACH and CLP. At present the group comprises of six active member states (Sweden, Germany, Denmark, the Netherlands, Belgium, Austria) and Norway. The group is not directly developing any strategies but has created a platform for information exchange. It also has created the possibility for various types of collaboration between two or more countries.

ECHA is coordinating and facilitating the group's work by organising meetings, helping with discussions about relevant risk reduction measures, arranging suitable times for the various activities and giving regulatory help and expert help to member states and the European Commission.

The group is currently working to produce a work plan for PFASs. Within the work plan the group has discussed efficient working practices and the best and most relevant regulatory measures, for example, how PFASs can be allocated to different groups.

### 4.3.1.3 The road to an EU action plan for PFASs

*Comparison between the nature of the Government assignment and activities at an EU level.*

Figure 2 shows concurrence between the activities in Sweden and ongoing activities at an EU level.

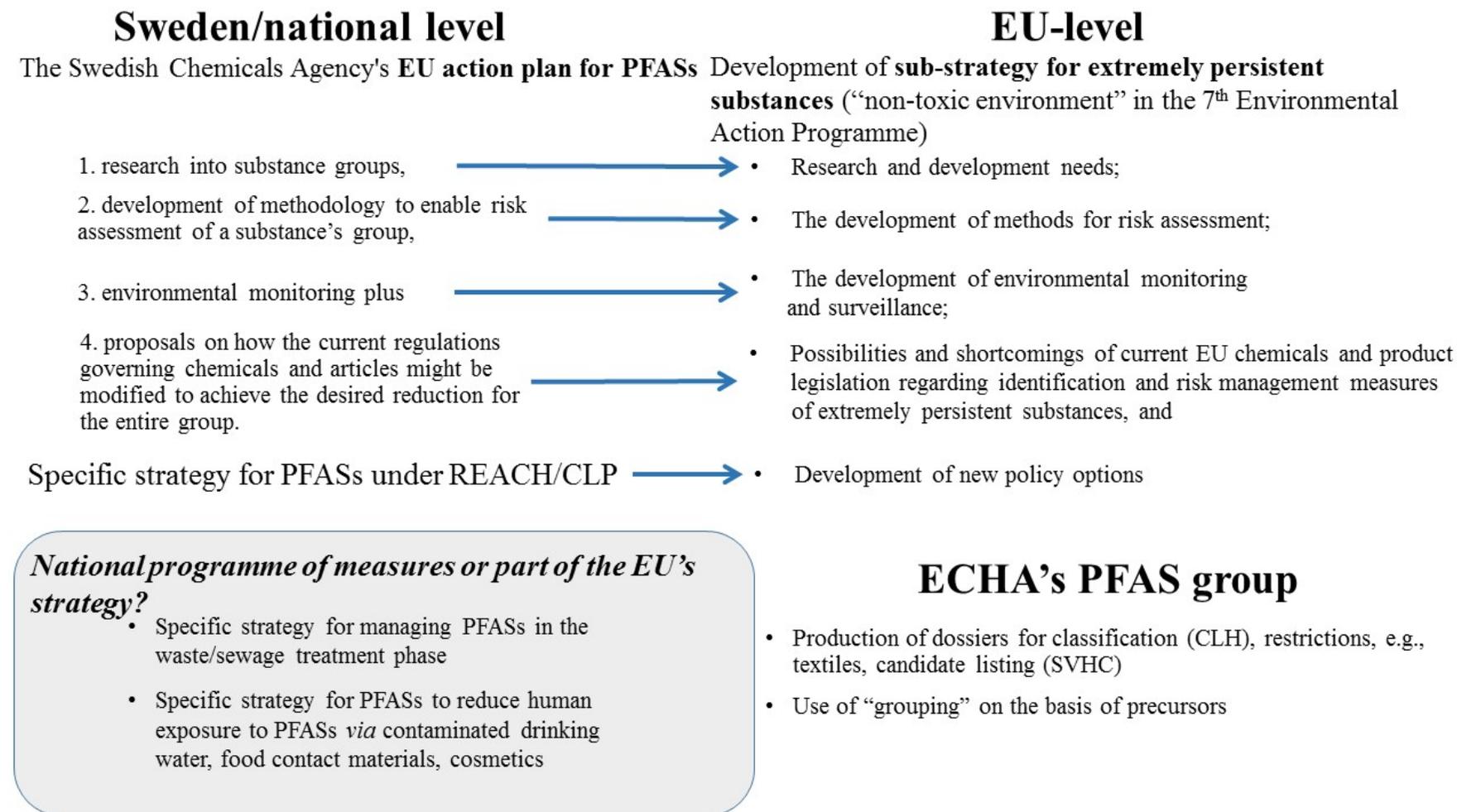


Figure 2 Activities in national and EU arenas

According to the Government assignment, Sweden's work with the EU action plan will involve activities in research, monitoring and risk assessment methodology, as well as an investigation of the need to change chemical legislation. Corresponding work has been initiated at an EU level within the framework for the above mentioned EU's 7th Environment Action Programme, in which a sub-strategy for persistent substances will focus on similar issues.

Because risk reduction measures are developed within the framework for REACH- and CLP-regulations, the Swedish Chemicals Agency considers that the work to develop the policy instrument, which is already available now, is important and should be seen as part of an EU action plan. ECHA's working group for PFASs is conducting such work.

We have identified the following areas as relevant to the ongoing work to reduce exposure to PFASs: use, recycling, waste management, sewage treatment, reduction of human exposure to PFASs, for example, *via* drinking water, textiles, food contact materials, and cosmetics. We have examined some of these areas within the framework of the national programme of measures. The Swedish Chemicals Agency considers that these areas should be covered by an overall strategy for a non-toxic environment in general (based on the idea behind a circular economy) and some parts should be included in a sub-strategy for persistent substances. Many articles which contain PFASs are manufactured outside the EU. We believe that it should also be possible to use EU dossiers produced for PFASs to nominate substances to the Stockholm Convention for global phasing out, in those cases where it is relevant.

***The Swedish Chemicals Agency's activities for the EU's action plan for PFASs.***

1. *We will focus on channelling our activities into influencing and submitting proposals for the EU's sub-strategy for persistent substances.*

The EU's sub-strategy for persistent substances is built on the Swedish ideas of a non-toxic environment. We therefore consider that the best way forward is to work actively with this sub-strategy. This is motivated by both strategy and resources. The contributions to the sub-strategy for persistent substances will stem from the knowledge and experience of the Swedish Chemicals Agency and other Swedish government agencies, as well as from analyses carried out in work with PFASs at a national level.

The Swedish Chemicals Agency has already established contact with the European Commission's consultant and has contributed a small amount of material and information. Amongst other things, the Swedish Chemicals Agency has participated in a workshop on non-toxic environments organised by the European Commission in June 2016. Our objective was to contribute the agency's experience. Recycling and waste management should be part of the EU's work with PFASs, aimed ultimately at supporting a circular economy. For this work to be successful on an EU level closer collaboration is needed between the Swedish Chemicals Agency and the Swedish Environmental Protection Agency.

2. *The Swedish Chemicals Agency is continuing its active work in ECHA's working group for PFASs.*

The Swedish Chemicals Agency believes that this working group has a major potential to develop new regulatory and scientific approaches to managing PFASs within the framework of existing chemical legislation, that is to say REACH and CLP. Knowledge of these regulations can be successfully used to restrict the use of

PFASs, provide support and contribute tools for developing the work with the sub-strategy.

The Swedish Chemicals Agency is contributing to devising a working plan for PFASs in 2016. We have also entered into a close collaboration with Germany for the restriction of a number of PFAS groups under REACH<sup>7</sup> and are now discussing joint initiatives.

3. *The Swedish Chemicals Agency will strengthen ECHA's work with PFASs.*  
The Swedish Chemicals Agency is currently analysing whether the work with PFASs within the framework of REACH and CLP needs more political weight, for example, by ECHA obtaining a mandate from CARACAL<sup>8</sup> to lead the PFASs work.

### **4.3.2 The Swedish Products Register**

PFASs have, as previously mentioned, such effective technical properties that they only need to be used at very low concentrations. The low consumption means that most PFASs on the market have an annual tonnage in the EU which is below the level that requires registration under REACH (at least 100 tonne per company per year<sup>9</sup>). There is therefore relatively little knowledge of how hazardous a substance might be. Unawareness of how hazardous a substance is means that these substances are not visible in the data reported to the Swedish Chemicals Agency's product register. This is because substances which lack hazard classification do not need to be reported to the Swedish Products Register if their concentration is less than five percent. The Products Register can therefore not be used to obtain a complete picture of how PFASs are used in Sweden. The application of chemical legislation restricts the possibilities for managing the risks from PFASs.

The Swedish Chemicals Agency intends in autumn 2016 to look into the possibility to establish a more stringent requirement for reporting the PFASs-group to the Products Register. A proposal will be presented before the end of 2016. Also, Göran Enander proposes in his study of PFAS contamination of drinking water (Government Offices 2016) that requirements for reporting PFASs to the Products Register should be changed. More stringent requirements should make it easier to find information on which PFASs are used in Sweden.

### **4.3.3 Dialogue**

Dialogue with trade and industry can serve as a national risk reduction measure, that is to say government agencies support companies in their efforts to replace hazardous substances without waiting for detailed provisions in the legislation.

The Swedish Chemicals Agency has previously held dialogues with prioritised sectors of trade and industry under the action plan for a toxic-free everyday environment. The dialogues contributed to varying degrees to substitution, increased knowledge and awareness amongst companies (Swedish Chemicals Agency 2015b).

With regard to PFASs, textiles and food contact materials are examples of article groups where dialogue can be a way of helping companies to work proactively and voluntarily

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<sup>7</sup> PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA and all PFASs that can be degraded to these substances

<sup>8</sup> Competent Authorities for REACH and CLP, CARACAL

<sup>9</sup> The registration limit will be reduced to 1 tonne from June 2018

replace highly fluorinated substances with less hazardous substances or materials. Dialogue can also inspire more companies to be one step ahead of the legislation.

In spring 2016, the Swedish Chemicals Agency and the National Food Agency discussed the possibility of initiating a joint dialogue with companies and other parties which manufacture, use and manage food contact materials. This sort of dialogue can be an important complement to legislation. At present in Sweden it is not possible to regulate companies which manufacture or import materials that will come into contact with food. The Ministry of Industry, Employment and Communications are examining the need for a competent inspection authority. There are also lessons to be learned from Denmark which has made some contributions in this area.

Dialogue can be effective in making trade and industry aware of the problem with PFAS. The role of government agencies is to strive for PFAS's substitution and/or reduction of incorrect usage and to help companies make an informed choice on what substances to use.

## **4.4 Other activities of the Swedish Environmental Protection Agency**

### **4.4.1 Work at a global level**

#### **4.4.1.1 The Stockholm Convention**

The Stockholm Convention is a global convention aimed at protecting human health and the environment against persistent organic pollutants POPs. They accumulate in humans and the environment over a long period and they are mobile and can therefore accumulate in living organisms, even at a significant distance from those locations where they were produced or used. Since 2009 PFOS are included in the Stockholm Convention which means that the production and use of articles containing PFOS and the management of waste containing PFOS are regulated globally. However, there are permitted uses: in fire-fighting foam, photographic film, etching agents for semiconductors and ceramic filters, hydraulic fluids in the aviation industry, some medical equipment, prevention of misting during hard chrome plating in a closed-loop system, and as insect bait for controlling two species of ants.

The review carried out in 2015 showed that there are available alternatives to PFOS. In 2016 the Stockholm Convention's expert committee will compile a list of these identified alternatives. The alternatives can be other PFASs or fluorine-free substances.

The regulation of PFOSs under the Stockholm Convention is implemented in the EU through the so-called POPs regulation (850/2004). This also covers POPs contained in articles. PFOS is still permitted in the EU in, for example, photographic film, hydraulic fluids in the aviation industry and for the prevention of misting during hard chrome plating in so-called closed-loop systems. According to a study carried out in 2015 (European Commission 2015) the only remaining need for PFOS in the EU is in the chrome plating industry. The use of PFOS in the chrome plating industry in Sweden was circa 30 kg in 2014.

According to a ruling from the European Court of Justice, the European Commission is responsible for nominating substances to the Stockholm Convention (case C 246/07) on behalf of EU member states. If several PFASs are to be nominated for phasing out, these nominations must be proposed either by the European Commission or by a country outside of the EU.

In June 2015 the EU nominated the substance PFOA to the Stockholm Convention. The substance's salts and substances that can be degraded to PFOA were also nominated. In 2015 the Convention's expert committee, which investigates nominated substances, ruled that PFOA fulfils the POPs criteria and decided to produce a risk profile to assess the need for global measures. If the risk profile is accepted at the committee meeting in 2016 a risk management plan will be drawn up, together with a recommendation to the Conference of the Parties in 2019. The Swedish Chemicals Agency will remain a member of the expert committee until May 2018.

In December 2013 the EU member states were asked which substances they would propose for nomination and Sweden proposed perfluorohexane sulfonic acid (PFHxS), amongst others. The Swedish Chemicals Agency still believes that the substance should be nominated.

#### **4.4.1.2 SAICM - the global chemical strategy**

The overall aim of the global chemical strategy (SAICM<sup>10</sup>) is to reduce the differences between countries in how they manage chemicals. The goal is to have functional chemical management throughout the world. SAICM is a politically binding agreement with declarations of intent but not binding regulations. The scope of SAICM is much broader than those of the conventions for chemicals and waste. The focus is not on individual substances but on risk management in a broader perspective.

The aim is to achieve the current global target of safe chemical management by 2020. This means that the strategy for conducting this will also remain in place until 2020. A process has started for discussing the continuation of this work after 2020. This process will be linked with the UN's goal of global sustainability. The Swedish Chemicals Agency believes that the Government should strive for a continuation of SAICM after 2020 and should open the way to a future global framework for substances that require global measures, for example, PFASs, if they do not fulfil the Stockholm Convention's criteria.

A number of areas have been designated, so called Emerging Policy Issues (EPI), within the framework of SAICM. There are currently seven of these. Sweden and the EU have in particular prioritised the need for global collaboration on information on chemicals in articles. The programme Chemicals in Products (CiP), aims for better information on chemicals in articles. The Swedish Chemicals Agency is the chair person in the programme's steering group, which also has representatives from various trade and industry sectors, including the textiles sector. A pilot project looking at textiles began in China in 2015. The programme is intended to create the preconditions for companies to gain better knowledge of the contents of their articles, thereby enabling them to make an active choice to reduce the risks to health and the environment. For the programme to function it needs many companies and sectors, especially those which have a broad global base, to continue working in accordance with the programme's goals and principles. Sweden should continue to promote that the programme for information on chemicals in articles has high relevance for the other focal areas in SAICM, for example, PFASs. Information on chemicals in articles is also vital if there is to be a more efficient use of resources, such as the safe recycling of textile material.

The focal area for PFASs is referred to as PFC (perfluorinated compounds) and is mainly managed by the USA and the Organisation for Economic Collaboration and Development (OECD) with the prime aim of collecting and exchanging information and supporting the transition to safer alternatives. The work has been coordinated by a global PFAS-group which is supported by the OECD and the UN's environment programme, UNEP. Sweden is involved

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<sup>10</sup> The Strategic Approach to International Chemicals Management

with the group through representatives from the Swedish Chemicals Agency. As part of the work to implement the strategy in this focal area, the OECD has developed a web portal for information exchange (OECD 2016).

#### **4.4.1.3 OECD - the Organisation for Economic Collaboration and Development**

The OECD's greatest strength as a global organisation for cooperation is in its scope and its resources for acquiring new knowledge and developing new methodologies through concrete activities.

With regard to the special properties of PFASs we intend to conduct internal discussions on how the OECD collaboration should be used to drive the issue on the need for new methodology for measuring bioaccumulation potential, mobility and toxicity.

#### **4.4.2 Enforcement of rules by the Swedish Chemicals Agency**

The Swedish Chemicals Agency's Enforcement Department has carried out several projects over the years where PFASs have been included. We supervise those PFASs that are subject to regulations governing how the substances are used today. Chemical regulations are largely harmonised in the EU where REACH is the most important regulatory system. A few PFASs are regulated under REACH. Another legal framework is offered by the POPs regulation, mentioned above, which today regulates PFOS.

In 2015 the Swedish Chemicals Agency analysed a total of 22 textile articles for adults and children to see whether they contained PFOS and PFOA. The articles analysed were 13 jackets or trousers (for sports, outdoor and everyday use, shell fabric, rainwear, and running clothes), one brassier (with a Teflon surface) and eight pairs of shoes (everyday-, running- and walking-shoes). Neither PFOS nor PFOA were found in any of the samples examined.

We are also planning to monitor PFASs in the inspection project in 2017.

#### **4.4.3 Collaboration with researchers**

Research on fluorine is greatly increasing concerning both the risk and benefit perspectives. It is therefore important to timely inform the research community about our lack of knowledge in this area (this also applies to other responsible government agencies). At the same time we require better knowledge about the reason for promoting the development of the use of PFAS. The Swedish Chemicals Agency has therefore intensified its contacts with researchers in chemical technology development, analytical chemistry, environmental chemistry, toxicology, ecotoxicology and environmental medicine. We are currently active in several PFAS-related research programmes and networks in Sweden and the EU.

A strategic area which most urgently needs to be developed in collaboration with researchers is a globally accepted categorisation system for PFASs which can also be used for the more complex molecules. This is necessary for developing a better functioning legislative text as well as regulations within the work of the Stockholm Convention.

The major PFAS application, in the form of polymers, also requires a deeper understanding with regard to occurrence and categorisation. Another important area of research is the safe handling of polymerised PFASs in waste- and recycling-systems. In particular the presence of banned substances in materials that are used for a long period of time before being discarded can present technological difficulties in future material recycling.

In order to promote our view of the risks associated with PFASs outside Sweden we need to actively participate in European research networks. One example is the organisation

NORMAN which works with the development of environmental monitoring methodology. The Swedish Chemicals Agency and the Swedish Environmental Protection Agency have begun to actively disseminate information on the results from our national survey work, with the aim of inspiring other European countries to tackle the problem with PFAS.

The Swedish Chemicals Agency has also established contact with research-oriented analysis laboratories in Europe to contribute to their analyses. Unpublished information from various government agency databases on the chemical identity and use of substances will be processed and made available. The aim is to improve the ability of research laboratories to identify PFASs and other industrial chemicals. Using patent information to predict future chemical use is a relatively unused methodology. In the Swedish Chemicals Agency's survey of PFASs (Swedish Chemicals Agency 2015a) we observed a strong growth in patents involving PFASs. The Swedish Chemicals Agency intends to carry out a more detailed analysis of these patents in collaboration with external experts. It will be appropriate to conduct this as a methodology development project.

With regard to research examining possible effects on human health and exposure to PFASs, the Swedish Chemicals Agency is active in several networks linked to such research. Representatives of the Swedish Chemicals Agency are participating in an external reference group for a research project which aims to study possible effects on the health of people in Ronneby, where the drinking water was contaminated with highly fluorinated substances. The departments of Occupational and Environmental Medicine in Lund and Gothenburg are coordinating the project which has grant funding up to and including 2018.

PFASs that are regulated or for some other reason have been replaced by the manufacturers, are often substituted by other PFASs that are less well known but have similar properties. To prevent inappropriate substitution there is therefore a need to examine the occurrence of total organic fluorine (TOF) or total oxidisable precursors (TOP) in both the environment and various products. Inappropriate substitution occurs when a hazardous substance is replaced by another substance which later also shows hazardous properties. TOF and TOP are under development at Swedish research institutions, amongst other places.

In 2016 the Swedish Chemicals Agency is leading a project which is analysing consumer products to determine the content of some specific PFASs and of TOF. The hope is that we will gain more knowledge about how many PFASs we miss when we only search for certain known PFASs analyses. The project is being conducted within the framework of the Nordic Risk Assessment Project (NORAP) and more PFAS projects could be carried out within NORAP in the future.

When we conducted our survey on PFASs in 2015 we learned that PFASs are often regarded as irreplaceable in many products. Companies find it difficult to find alternatives to PFASs. This is probably due to the unique properties of PFASs. The technological development of alternatives is also needed to reduce the use of PFASs. An example of the ongoing research is the FORMAS-funded textile project SUPFES (2015) in which the Swedish Chemicals Agency is participating in the reference group. Researchers and industry are collaborating in the project to find alternatives that can replace harmful PFASs in textiles. Researchers will assess the risks from various chemicals and determine whether the new alternatives actually produce the desired effects.

#### **4.5 Activities engaged in by other government agencies**

As we mentioned earlier in this report several government agencies are affected by the risks that PFASs pose for groundwater and drinking water. Collaboration with other government

agencies is therefore an important part of the Swedish Chemicals Agency's strategy and with the national programme of measures. Several Swedish government agencies also have their own activities and government assignments involving PFASs. In this section we give a few examples of these.

#### **4.5.1 Food and drinking water**

The National Food Agency has brought forward risk management measures for drinking water contaminated by PFASs. The measures are targeted at drinking water suppliers and inspection authorities. If a drinking water production facility is, or is suspected to be, affected by PFASs, concentration in the drinking water should be investigated. In 2016 the National Food Agency issued recommendations that the monitoring of drinking water should be expanded to include four new PFASs, bringing the total to eleven PFASs.<sup>11</sup> One of the reasons for this is that PFASs that are present in current fire-fighting foam, should also be checked. Concentrations higher than 90 ng PFASs<sup>11</sup>/l should be reduced as much as possible. At concentrations above 900 ng PFASs<sup>11</sup>/l the National Food Agency recommends that consumers do not use the water for cooking food or as drinking water. The National Food Agency's action threshold is based on the tolerable daily intake (TDI) for PFOS (which is currently 150 ng/kg/d) and on the assumption that all PFASs have the same toxicity, that is to say a conservative assumption. The action thresholds are not legally binding but are indicative and can be revised, for example, in a future revision of the TDI. The National Food Agency is also contributing guidelines for risk management for fish with elevated concentrations of PFOS. As the presence of substances in fish is a local concern, the National Food Agency has decided to provide advice and support only where it is needed, rather than publishing national dietary advice for the whole population. Regulatory and inspection authorities are called upon to measure the concentrations of PFOS in fish if contamination is suspected and where measures are required in the form of, for example, fishing bans or dietary advice concerning fish from contaminated watercourses.

The National Food Agency also monitors the population's exposure to known PFASs *via* the periodic food basket surveys (every 5th year). The results from the food basket surveys are used for calculating intake as part of PFAS exposure evaluations in risk assessments carried out by the National Food Agency for, amongst other things, PFOS in fish and PFASs in drinking water. The National Food Agency also conducts repeated biomonitoring of PFAS blood concentrations in the population to gain a picture of the total PFAS exposure in Sweden, which is important in the risk assessment of PFASs. Biomonitoring takes place in studies of eating habits (*Riksmaten*) and in the time series analysis of first-time mothers in Uppsala (POPUP).

#### **4.5.2 Soil and groundwater**

In 2015 the Swedish Geotechnical Institute (SGI) was assigned by the Government to obtain preliminary indicative values for PFASs in soil and groundwater. This assignment, the results from which were reported in November 2015, is part of the work to reduce the risks which these substances pose for humans and the environment. The idea is to use the preliminary indicative values as the basis for general indicative values. The study gave preliminary indicative values for PFOS and proposals for methodology to risk assess PFASs other than PFOS. The study gave rise to a report for PFOS that can be used in assessing location-specific indicative values for PFOS (SGI 2015).

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<sup>11</sup> Previous 7: PFBS, PFHxS, PFOS, PFPeA, PFHxA, PFHpA, PFOA. New 4: PFBA, PFNA, PFDA, 6:2 FTS

### **4.5.3 Screening**

In Appropriation Directions for 2015 the Swedish Government mandated the Swedish Environmental Protection Agency with an assignment to screen the occurrence of environmental toxins, including PFASs, in surface- and groundwater, to analyse the result and, where necessary, to propose measures. The results of the assignment were reported in March 2016. Five hundred analyses were conducted in surface- and groundwater throughout Sweden. These were complemented with a collection of 5,600 older samples and a survey of sources of PFASs, mainly in surface- and groundwater. The results reveal over 2,000 potential local sources but there is still a lack of measurements at many known potential point sources, such as fire training locations, sewage plants, waste management facilities and industries. The Swedish Environmental Protection Agency is also reporting on measures being implemented in different areas (Swedish Environmental Protection Agency 2016).

### **4.5.4 Implementing the Stockholm Convention**

In Appropriation Directions for 2016 the Swedish Government mandated the Swedish Environmental Protection Agency an assignment to update the Swedish implementation plan from 2012 for the Stockholm Convention by November 2017 at the latest. This work is to be conducted in collaboration with the Swedish Chemicals Agency and the Swedish Agency for Marine and Water Management. In conjunction with this assignment the Swedish Chemicals Agency has commented on the need to update the implementation plan for phasing out of PFOS. Amongst other things, clarification is needed on how the remaining national uses of PFOS, allowed because of exemptions, are monitored so that the amount of PFOS released into the environment is minimised in accordance with the Convention's stipulations. For example, with the best available technology the use of PFOS in hard chrome plating should only take place in so-called closed-loop systems. This needs to be examined further with regard to how it is defined, given that up to 20 percent is probably released from the process *via* the ventilation air or waste water. Management of waste from the chrome plating industry also needs to be examined. This sort of waste is currently sent to landfill for hazardous waste (Swedish Environmental Protection Agency 2012) but we question whether this is a sustainable solution, bearing in mind the properties of PFOS.

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