Ostrum ASSET MANAGEMENT

Enhancing your power to act

CONFRONTING PFAS:

AN IN-DEPTH REVIEW OF RISKS, REGULATIONS, AND CORPORATE STRATEGIES

February 2025

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An affiliate of: NATIXIS INVESTMENT MANAGERS

Executive summary

The concept of planetary boundaries was introduced in 2009 to raise awareness of the risks associated with abrupt global environmental changes. Currently, we have crossed six out of the nine identified boundaries. The boundaries that have been breached are climate change, biosphere integrity, land-system change, freshwater change, biochemical flows and novel entities.[1] Additionally, it is hypothesized that environmental contamination by per- and polyfluoroalkyl substances (PFAS) may represent a separate boundary that has also been crossed[2].

Levels of PFAS today often exceed safe limits in rainwater, soils, and surface waters. For instance, two of the oldest and most common types of PFAS – PFOA and PFOS – have seen their concentration in rainwater frequently surpassing the Unites States Environmental Protection Agencies' Lifetime Drinking Water Health Advisory levels. Other PFAS are equally concerning. For example, in Paris, TFA levels in tap water are 62 times higher than recommended safety thresholds.

PFAS are synthetic compounds widely used in various industries for their water- and oil-repellent properties, infiltrating cleaning products, textiles, cookware, personal care items, and firefighting gear. The contamination from these substances poses substantial risks to both human health and the environment, as they have the ability to bioaccumulate in organisms, including the human body. Their notable persistence and toxicity have earned them the name of "forever chemicals".

Three types of PFAS (PFOS, PFOA, and PFHxS) are banned under the Stockholm Convention, signed by 152 countries, due to their carcinogenic properties. Recent months have seen a surge in regulatory proposals targeting these chemicals. Most notably, the European Chemicals Agency in Europe has proposed a comprehensive ban on over 10,000 PFAS. If adopted, this ban, potentially effective as early as 2027-28, would be one of the largest chemical bans in history. Despite a complex international context with potential risks of deregulation, growing media attention and public concern are fueling pressure for stricter controls. In France for example, on February 20, 2025, deputies passed a law banning the use of PFAS in cosmetics, as well as in most apparel textiles and footwear, effective from 2026.

The scale of the PFAS problem also presents significant financial risks, with estimated decontamination costs in Europe potentially reaching €2 trillion over the next two decades, according to recent media investigation[3]. All these issues have led investors to take a stand. The Investor Initiative on Hazardous Chemicals (IIHC), comprising 60 participants managing over $12 trillion, aims to mitigate financial risks linked to hazardous chemicals, including PFAS. Coordinated by the NGO ChemSec, this initiative provides vital resources to help companies identify high-concern chemicals and navigate the transition towards safer alternatives. Ostrum AM joined this initiative in 2024, reinforcing its collective drive for change.

In the framework of its Worst Offenders Policy, Ostrum AM has conducted an analysis of the largest PFAS producers. Ostrum AM's Worst Offenders Methodology, which is based on four criteria (proven facts, severity, systemic nature and remediation), has been widened to include PFAS. This evolution impacts the consideration of companies, potentially placing them:

- *on the **Worst Offenders Exclusion List** (Group 1 (G1): companies that tick the first three criteria as per the Worst Offenders' methodology – proven facts, severity and systemic nature – and which have undertaken insufficient remediation actions);*
- *on the Worst Offenders **Watch List** (G2: companies that tick the first three criteria yet are in the process of ongoing remediation, thus have been put on the Watch List in order to monitor the remediation; or G3: companies that tick only one or two of the first three criteria, yet are identified as candidates that require monitoring – as they may be invested companies in the firm's portfolios and/or there is a high risk of being put on the Worst Offenders Exclusion List);*
- *on the **Other Controversies** List (G4: companies that do not meet the above criteria, thus companies that do not tick the first three criteria and/or companies with a satisfactory remediation).*

Stewardship is a central element for Ostrum AM, and our engagement efforts target companies where we believe that further remediation actions are possible, where we may have a significant investment and/or where company management is open to discussion. We therefore defined an exception for companies that should fall in the Worst Offenders Exclusion List but where we believe that engagement could have a positive impact. However, for each case, there is a defined escalation strategy, implying the company would be put back on the Exclusion List if the engagement does not lead to the expected results.

[1] Stockholm Resilience Center, Planetary Boundaries, accessed 10/09/2024
[2] Environmental Science & Technology, Outside the Safe Operating Space of a New Planetary Boundary for Per- and Polyfluoroalkyl Substances (PFAS), 02/08/2022
[3] Le Monde, PFAS : le coût vertigineux de la dépollution de l'Europe, 14/01/2025

Content

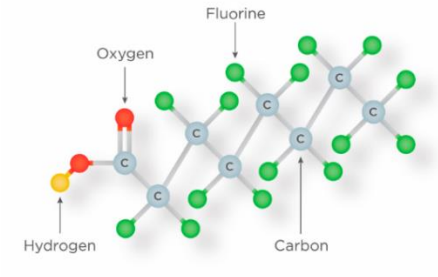
Glossary

- **ECHA**: *the European Chemicals Agency*
- **EPA**: *the US Environmental Protection Agency*
- **PFAS***: Per- and polyfluoroalkyl substances,* also called "forever chemicals"
- **PFHsX**: *Perfluorohexane sulfonic acid*, type of PFAS. Forbidden worldwide since 2022 through the Stockholm Convention
- **PFOA**: *Perfluorooctanoic acid,* type of PFAS recognized as carcinogenic to human. Forbidden worldwide since 2020 through the Stockholm Convention
- **PFOS**: *Perfluoro octane sulfonate,* type of PFAS recognized as potentially carcinogenic to human. Forbidden worldwide since 2009 through the Stockholm Convention
- **RAC**: *ECHA's scientific committees for Risk Assessment*
- **REACH**: *Registration, Evaluation, Authorization and Restriction of Chemicals,* is an EU regulation aimed at protecting human health and the environment from chemical risks
- **SEAC**: *ECHA's scientific committees for Socio-Economic Analysis*
- **SVHC***: Substances of Very High Concern,* according to REACH's methodology
- **TFA**: *Trifluoroacetic acid,* the shorter PFAS as of today
- **TSCA**: *Toxic Substances Control Act,* US regulation to evaluate chemicals risks

1. Understanding PFAS: key industrial chemicals and their environment and health impacts

Complex chemicals with diverse industrial applications

According to the Organisation for Economic Co-operation and Development (OECD)[4] and the United Nations Environment Programme (UNEP)[5] definition, PFAS are molecules consisting of a chain of carbon atoms that can either be linear, branched or cyclic, of varied length. They contain at least one fluorinated group, such as methyl or methylene. To this fluorocarbon skeleton can be added different functional groups that give these molecules distinct physical, chemical, and toxicological properties.



Source: American Water Works Association

There are three main categories of use for PFAS:

- the use of PFAS to **produce other substances** (example: polymers),
- the use of PFAS in **industrial systems** (gaskets, electrical cable insulators, etc.),
- the use of PFAS directly in **consumer products** and equipment goods, particularly domestic.

PFAS are widely used in many industrial applications due to **their water and oil repellent properties**. They are, for instance, found in fire-fighting foams, paints and pesticides, but also in day-to-day products like cleaning products, water resistant fabrics, such as rain jackets, umbrellas and tents, non-stick kitchen utensils, personal care products, such as shampoo, dental wires, nail polish and eye makeup, or stain-resistant coatings used on carpets, upholstery, and other fabrics.

Source: American Water Works Association

[4] OECD, Reconciling Terminology of the Universe of Per- and Polyfluoroalkyl Substances: Recommendations and Practical Guidance, OECD Series on Risk Management, No. 61, 2021
[5] UNEP, Per- and Polyfluoroalkyl Substances (PFASs), accessed 03/09/2024

PFAS in the environment: "forever chemicals"[6]

PFAS' sources of emissions are numerous but, for many, little known and poorly monitored. **The only certainty is their anthropogenic origin, i.e. they all are a result of human activity**. PFAS are released into the environment through:

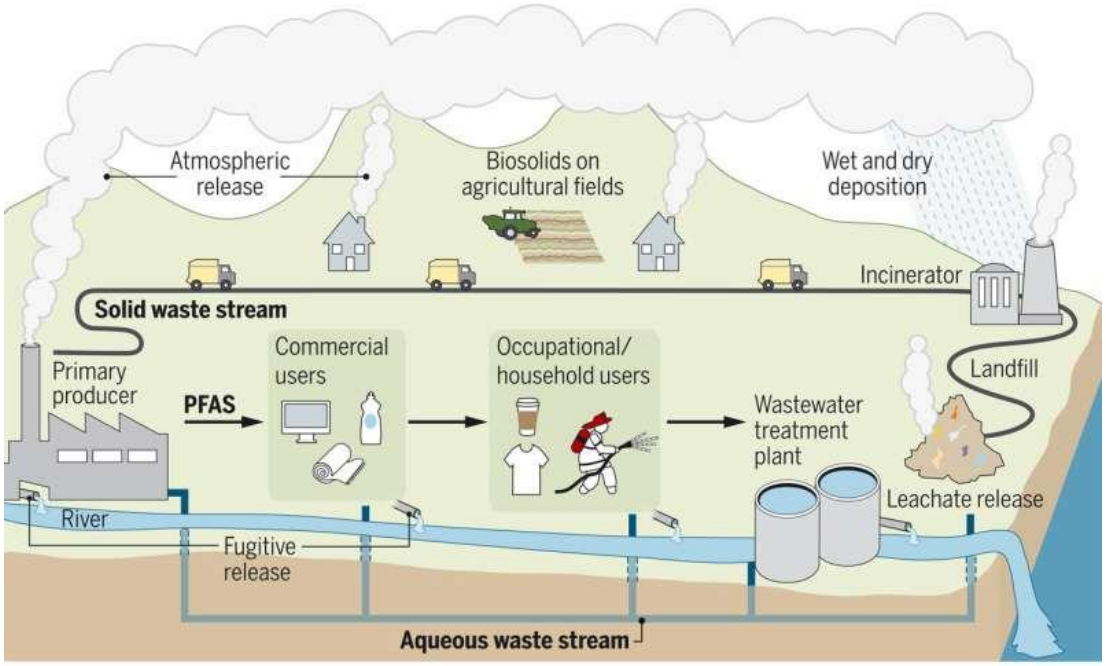
- industrial facilities,
- sewage treatment and incineration plants (aqueous or atmospheric discharges, spreading sludge),
- spreading by diffusion when using products containing PFAS or substances that degrade to PFAS (such as fire-fighting foams, which are widely used at airport sites, products spilled on crops, ski wax),
- waste that also contains them (electronic objects, textiles, medical devices, paints, etc.)[7].

Once released into the environment, PFAS easily **migrate from soil to groundwater** and can travel long distances as they are water soluble, mobile in soils. PFAS also have long lifetimes. Indeed, PFAS' carbon-fluorine bond strength makes them very stable and resistant.

In addition, once PFAS have entered an organism, they can be distributed to different organs and tissues and get "stuck". This ability to "**bioaccumulate"** concerns human organisms, but also fauna and flora.

In aquatic environments, organisms absorb PFAS through food and direct contact with water. Fishes are particularly subject to this issue because they consume other aquatic organisms containing PFAS, resulting in a snowball effect called "biomagnification". At the top of food chains, large mammals that consume contaminated fish, such as polar bears or seals, are also highly exposed to PFAS.

PFAS can be directly transmitted from the female parent to the embryo, with molecules detected in birds, fish, and reptiles' eggs. PFAS can also cross the placental barrier of mammals.



Source: Phys.org

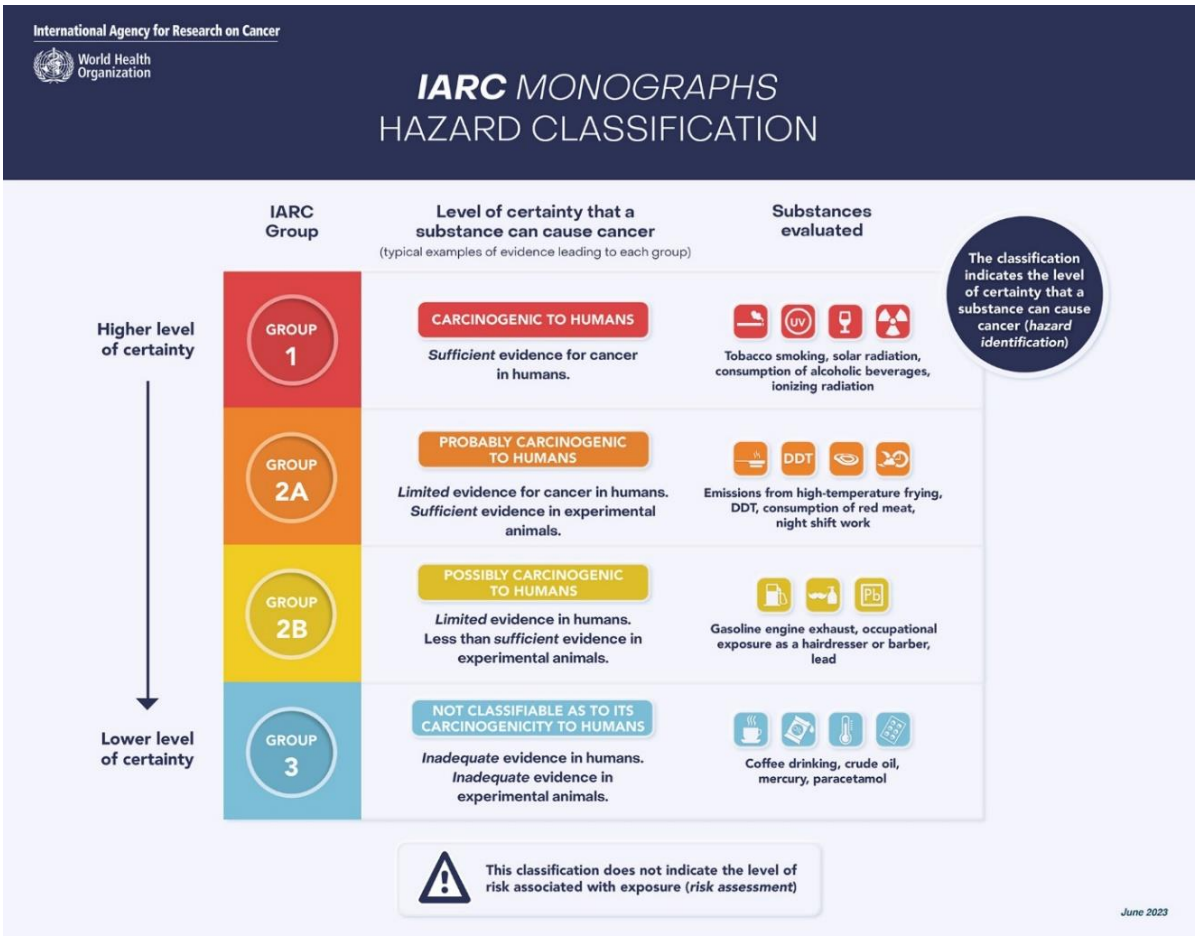
[6] Québec INSPQ, PFAS : définition et utilisation, fiche technique, accessed 01/09/2024
[7] Cyrille Isaac-Sibille, Mission auprès du Gouvernement, Rapport public, Per- et polyfluoroalkylés (PFAS), pollution et dépendance : comment faire marche arrière ?, 01/04/2024

Health risks: the toxicity of PFAS to human health

According to scientific research, **PFAS impact hormonal and immune systems and are associated with chronic health risks**. **PFAS are considered endocrine disruptors** that can be linked to fetal developmental problems, liver impacts, cholesterol problems, and they can also be linked to increasing the risks of certain cancers.

However, according to science, it is not yet demonstrated that the entire family of PFAS is harmful to human and ecosystem health. **Health effects associated with exposure to PFAS are difficult to specify for many reasons**. In fact, there are thousands of PFAS with potentially varying effects and toxicity levels, yet most studies focus on a limited number of PFAS. Also, the types and uses of PFAS change over time, making it difficult to track and assess how exposures occur and affect human health[8].

IARC, the International Agency for Research on Cancer, has established monographs, which represent a series of scientific analyses identifying environmental factors that may increase the risk of cancer in humans. Each monograph includes a critical review of relevant scientific studies of a known or suspected carcinogen, followed by an assessment of the degree of indication that this agent may or may not alter the risk of cancer in humans. Each monograph is written by an interdisciplinary working group composed of international scientific experts.



Source: International Agency for Research on Cancer

[8] EPA, Our current understanding of the human health and environmental risks of PFAS, 26/11/2024

In November 2023, the IARC experts published a report focused on two categories of PFAS:

- **PFOA** (perfluorooctanoic acid) which is classified in the group 1 **"carcinogenic to humans".** PFOA is commonly used in the production of non-stick coatings, waterproof textiles, cleaning products, industrial chemicals, and other similar applications.
- **PFOS** (perfluoro octane sulfonate) which is classified in the group 2B **"possibly carcinogenic to humans"**[9]. PFOS is mainly used in non-stick coatings, waterproof products, cleaning products, foaming agents, and flame retardants.

A third PFAS has been recognized toxic for human health: the **PFHsX,** (perfluorohexane sulfonic acid), which is used in a variety of consumer products, such as non-stick coatings, waterproof products, textiles, cleaning products, flame retardants, and in industrial applications such as foaming agents and surface coatings.

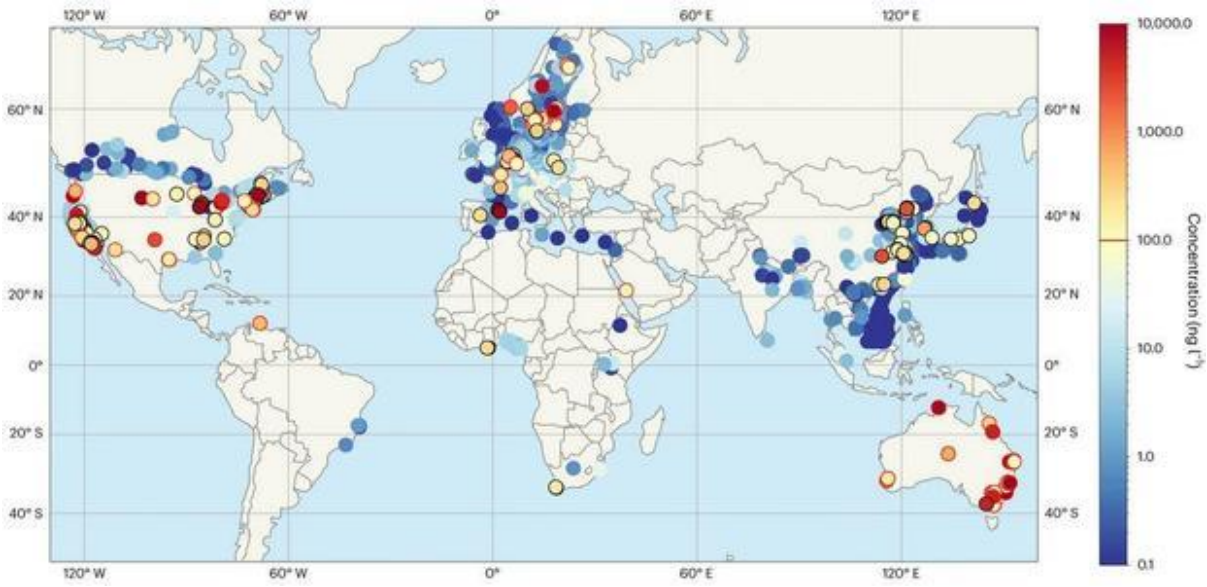
Market dynamics: small market size yet widespread environmental impact

The PFAS market represents only a small size of the overall chemical market

In 2022, the global market size for PFAS was estimated at around USD 28 billion,[10] whereas the overall size of the chemicals industry stood at USD 4.73 trillion. Based on these estimations, PFAS production only accounts for 0.5% of total chemical production.

PFAS pollution has no borders

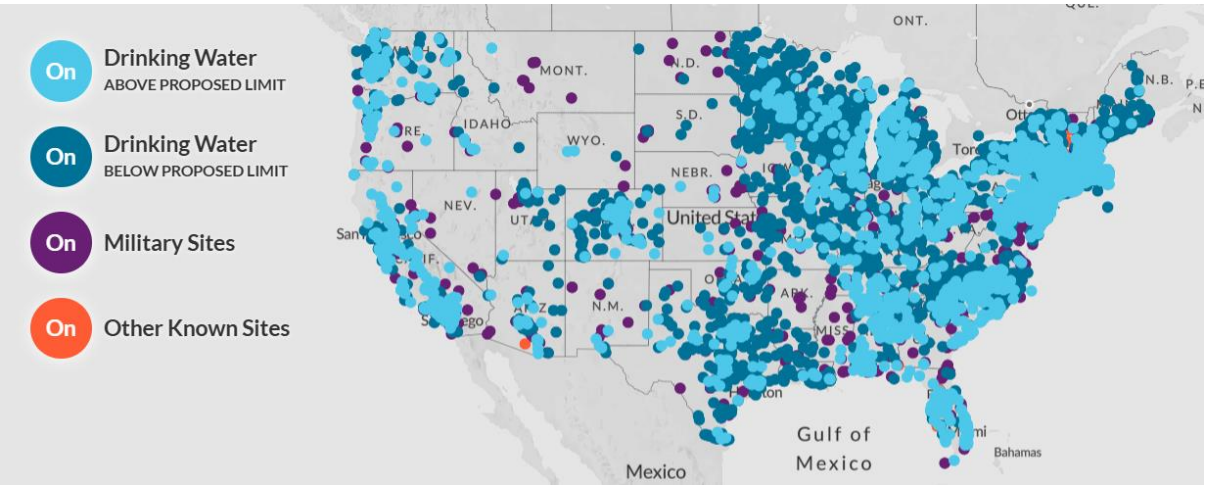
Several studies have been produced, analysing the spread of PFAS contamination. A paper published by *Nature Geoscience* in April 2024, for example, analysed 45,000 water samples globally and 20 types of PFAS, finding a "substantial fraction" of the samples had levels of PFAS above recommended levels.[11] **If compared to minimum standards set in Canada (one of the strictest standards), 69% of the groundwater samples worldwide have exceeded the set limits.** In addition, 6% of the worldwide samples exceeded the EU's standard. The following image illustrates the phenomena.



Source: CBS News

[9] ActuEnvironnement, PFAS: l'OMS relève le niveau de cancérogénicité de deux substances, 01/12/2023
[10] ChemSec, The top 12 PFAS producers in the world and the staggering societal costs of PFAS pollution, 05/25/2023
[11] Ackerman Grunfeld, D., Gilbert, D., Hou, J. *et al.* Underestimated burden of per- and polyfluoroalkyl substances in global surface waters and groundwaters. *Nat. Geosci.* 17, 340–346, 2024

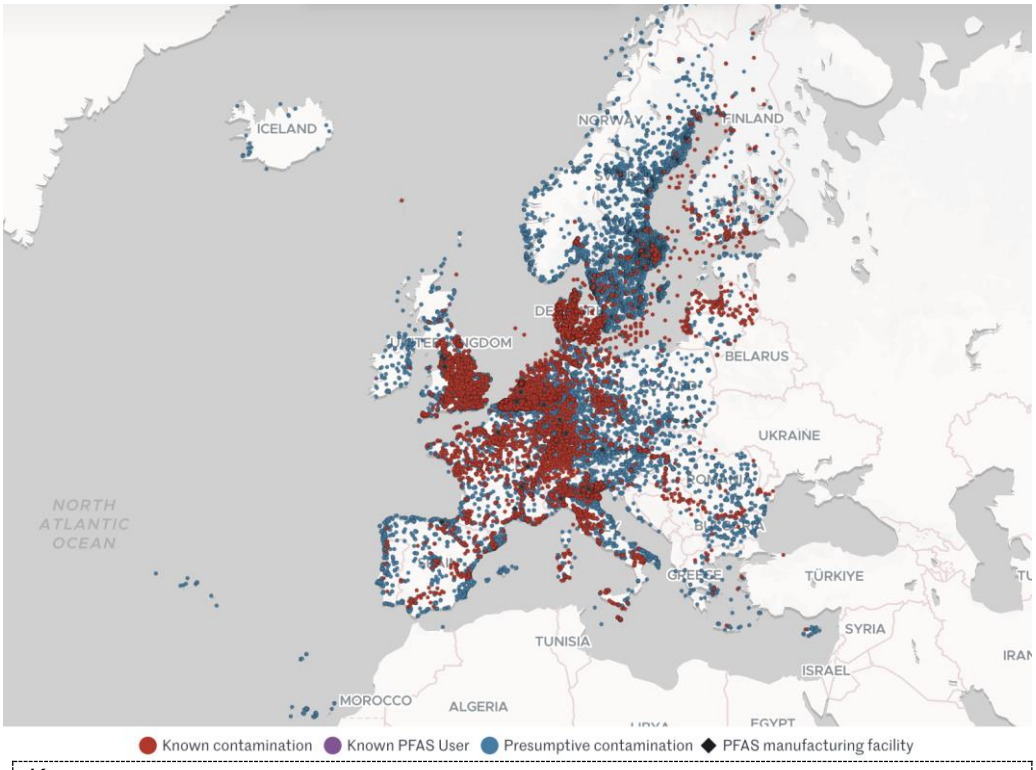
The non-profit Environmental Working Group retrieved data from the US Environmental Protection Agency in November 2024 to map PFAS contamination in the United States. This exercise revealed that **more than 2,000 sites had detectable levels of PFAS.** It also confirmed that "**143 million people in communities throughout the U.S. have drinking water that has tested positive for PFAS**."[12]



Source: Environmental Working Group

The first cases of PFAS pollution were identified in the 1990's, in the United States, Italy, Belgium and Sweden. The European Chemicals Agency (ECHA) estimates that 4.5 million tons have been emitted over 30 years and **75,000 tons in 2020 alone.**[13]

[12] Environmental Working Group, PFAS contamination in the U.S., 20/11/2024
[13] ECHA, Webinar: Consultation on restruction proposal for per- and polyfluoroalkyl substances (PFAS), 05/04/2023



Key:

- *Known contamination: sites where PFAS have been detected.*
- *Known PFAS user: industrial sites for which there is evidence of PFAS use.*
- *Presumptive contamination site: presumptive contamination site based on scientific investigations and expert advice, not confirmed by testing.*
- *PFAS manufacturing facility.*

Source: Forever Pollution Project

In 2023, the Forever Pollution Project, a collaborative cross-border and cross-field investigation led by 16 European newsrooms, found that **23,000 sites are contaminated across Europe by PFAS, and 21,500 sites are presumably contaminated[14], including 2,100 "hotspot"** sites with more than 100ng/L (European limit).

Focus on TFA contamination:

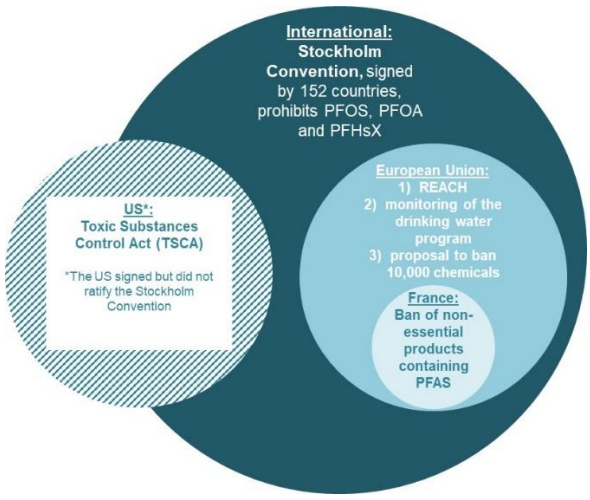
A study published in May 2024 reveals **widespread contamination of waterways in Europe by trifluoroacetic acid (TFA)**, a little-known and poorly regulated PFAS, resulting from both the manufacture and degradation of other PFAS. The results of this study demonstrate the presence of PFAS in all samples and more than 98% of TFA. This substance is not currently the subject of any specific standard, but TFA concentrations exceed the limit value of 500 nanograms per liter (limit of the total sum of PFAS presented to the European Drinking Water Directive, which must apply from 2026). The toxicity of this substance is not yet known.

[14] The Forever Pollution Project Website, 2023

2. Regulatory efforts to mitigate negative impacts at global and local levels

Various legislations with diverse scope and geographic reach have been established.

- **The Stockholm Convention** (international reach) applies to all countries that ratified the convention, forbidding three types of PFAS worldwide (PFOS, PFOA, PFHxS).
- **European regulation**, such as REACH, established in 1998, and the Drinking Water Directive, first adopted in 1980 and revised several times since then. The European Union is also working on a proposal to ban PFAS-containing products, seeking to regulate chemicals in circulation and to promote safer alternatives.
- **France** has also adopted an unprecedented bill to ban non-essential products containing PFAS, starting in 2026.
- In the **United States**, the Toxic Substances Control Act (TSCA) of 1976, established by the Environmental Protection Agency (EPA), requires reporting, record-keeping and testing requirements and restrictions relating to chemical substances and/or mixtures.



Source: Ostrum AM, February 2025

International prohibitions: 3 PFAS banned under the Stockholm Convention

The Stockholm Convention has been signed by 152 signatories, including the European Union which ratified it in 2004. It was also signed by the United States, but it was never ratified, meaning they are not legally bound to adhere to the terms of the convention.

Three PFAS (their salts and derivatives) are prohibited by the Convention :

- **PFOS since 2009**. Since prohibition, alternative PFAS with shorter chain perfluoro carboxylic acids (PFCAs) have been used to replace PFOS in many products.
- **PFOA since 2020**. Since prohibition, shorter chain perfluoro carboxylic acids (PFCAs) have been used to replace PFOA. In addition, some manufacturers have developed PFOA-free coating technologies for non-stick cookware, for example. PFOA has also been replaced by other chemicals such as GenX polymers or PFBS (perfluorobutane sulfonic acid) and its salts. Those chemicals have been included by ECHA on its list of Substances of Very High Concern (SVHC) in 2019 because of their toxicity on human health[15].
- **PFHxS since 2022**. Alternatives to this chemical include PFAS with shorter chain fluorinated compounds, as well as non-fluorinated substances that offer similar properties, such as fluorine-free non-stick coatings.

Long-chain perfluorinated carboxylic acids (C9-21 PFCAs) are being considered for inclusion in the Stockholm Convention[16].

[15] Que choisir, Téflon, plastiques, silicone, mélamine…quels matériaux privilégier ?, 19/05/2021
[16] ECHA website, accessed 02/09/2024

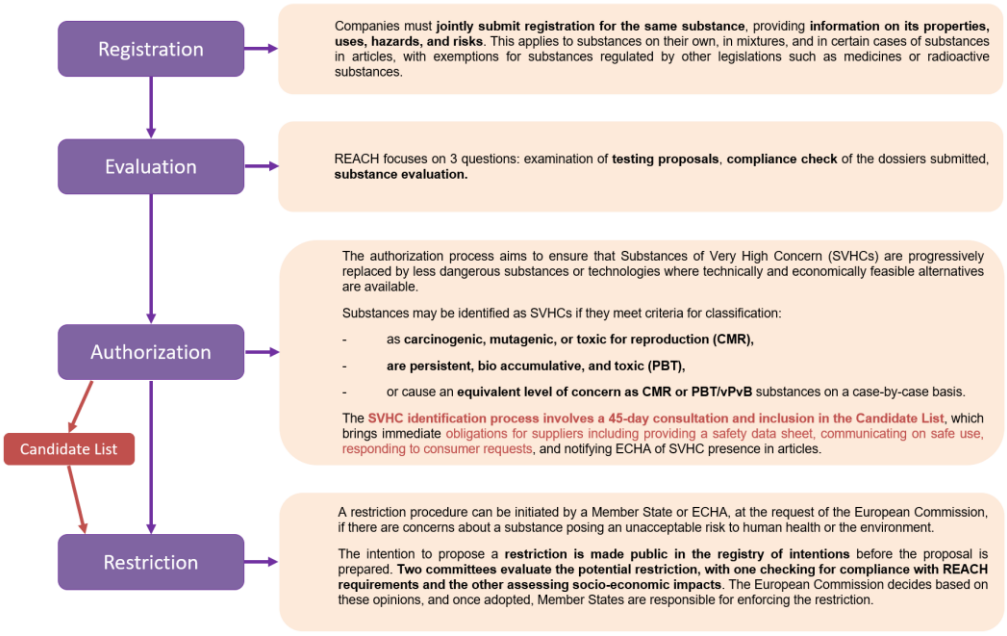
European Union: several regulations and a proposal to ban 10,000 PFAS

The European regulation REACH is a tool to improve the protection of human health by regulating the risks posed by chemicals

REACH, which stands for *Registration, Evaluation, Authorization and Restriction of Chemicals*, is EU regulation aimed at **protecting human health and the environment from chemical risks** and at promoting alternative hazard assessment methods to reduce animal testing.[17] It **applies to all chemicals, including PFAS.** The European Chemicals Agency (ECHA) evaluates registrations for compliance, while EU Member States assess selected substances for human health and environmental concerns. Authorities and the ECHA's scientific committees evaluate substance risks and can ban hazardous substances or impose restrictions on use. They are also responsible for regulating the market entry of chemicals.

As for **companies**, they must bear the burden of proof, identifying and managing substance risks, demonstrating safe usage to the ECHA, and communicating **risk management measures** to users. If risks can not be managed, authorities can impose restrictions on the substances' use. For companies wishing to continue using high concern substances, an authorization request must be submitted, explaining the intended uses of the substance, along with the risk management procedure and a socio-economic analysis of costs associated with a eventual authorization refusal.

Companies established outside the EU are not bound to respect REACH's obligations, even if they export their products to the customs territory of the European Union. **It is the responsibility of importers established in the European Union or the exclusive representative of a manufacturer from a non-EU country established in the European Union to comply with REACH requirements**, such as registration.



Source: European Commission, Ostrum AM, September 2024

Leveraging the REACH framework, the European Commission continues to expand its restrictions on "forever chemicals". Announced on September 19, 2024, and made effective October 10, 2024, a new restriction targets perfluorohexanoic acid (PFHxA) and related substances, frequently used as a substitute for the already banned PFOA. This restriction focuses on consumer products like textiles, food packaging, and cosmetics, as well as firefighting foams, with varying transition periods extending to 2026, 2027, and 2029. While exempting critical applications such as semiconductors and batteries where alternatives are limited. This action represents a significant step in the EU's commitment to reduce PFAS emissions and their environmental and health impacts.[18]

[17] European Commission, REACH Regulation, accessed 29/01/2025
[18] Actu Environnement, L'Europe restreint l'usage de plusieurs PFAS, 20/09/2024

The European countries aim to forbid gradually PFAS, starting in 2026

EU threshold for PFAS concentration in drinking water

European regulation will require the inclusion of PFAS measurement in the health monitoring of drinking water starting January 1, 2026[19] as part of its directive on the quality of water intended for human consumption (December 16, 2020)[20]. The established threshold is 100 ng/L for 20 listed PFAS in drinking water. While the EU threshold is a significant regulatory step, it stands in contrast to stricter, but non-binding guidelines set by other countries – such as Canada's 30 ng/L, the US EPA's 4 ng/L, and Denmark's 2ng/L[21].

The proposal of the ECHA to forbid PFAS

In February 2023, the ECHA published a proposal to forbid PFAS (universal PFAS restriction, "uPFAS"). This initiative is considered "one of the largest chemical bans ever imposed in Europe," according to the joint declaration of the five states behind the proposal: Germany, the Netherlands, Denmark, Sweden, and Norway[22]. **The ban would potentially impact more than 10,000 PFAS[23].**

The project is supported by France and should be submitted to the EU members by the European Commission in 2025, for a **possible implementation in 2026**. **Derogations are being considered**, (from 5-12 years) **to allow industrials to transit**. Unlimited derogations are considered for sectors subject to specific regulations (plant protection products, biocides, medicinal products), as sometimes, safer alternatives do not exist yet.

A six-month consultation has been launched in March 2023, gathering a very high number of opinions (5,642 comments received from individuals and organizations). As of today, the ECHA's scientific committees for Risk Assessment (RAC) and for Socio-Economic Analysis (SEAC)[24] **are still evaluating the proposed restriction** together with the comments from the consultation in batches, focusing on the different sectors that may be affected. In tandem, the five national authorities who prepared the proposal, are updating their initial report to address the consultation comments. This updated report will be assessed by the committees and will serve as the foundation for their opinions.

The ECHA recently published an update on the restriction proposal for PFAS, dated November 20, 2024.[25] This update highlights significant progress, including the explicit mention of "sealing applications" and the differentiation between fluoropolymers and non-polymeric PFAS. ECHA emphasizes the importance of fluoropolymers in various sectors, such as protective equipment and power transmission systems, while exploring restriction options that aim to minimize emissions without imposing an immediate total ban.

[19] Agence Régionale de Santé Hauts-de-France, PFAS : contrôle de l'eau potable, 07/01/2025
[20] Vie publique, Proposition de loi visant à protéger la population des risques liés aux substances perfluoroalkylées et polyfluoroalkylées (PFAS), 31/05/2024
[21] Cyrille Isaac-Sibille, Mission auprès du Gouvernement, Rapport public, Per- et polyfluoroalkylés (PFAS), pollution et dépendance : comment faire marche arrière ?, 01/04/2024
[22] Le Monde, Polluants éternels, les Européens ouvrent la voie à une interdiction massive des PFAS, 07/02/2023
[23] Novethics, Proposition historique pour interdire les polluants éternels PFAS au sein de l'Union Européenne, 02/11/2023
[24] ECHA, Next steps for PFAS restriction proposal, accessed 02/09/2024
[25] ECHA, Progress update on the per- and polyfluoroalkyl substances (PFAS) restriction process, 20/11/2024

France's ban of non-essential PFAS-containing products

At the start of 2024, French deputies submitted a proposal **seeking to prohibit the manufacture and sale of non-essential products containing PFAS**.[26]. The proposal was adopted at first reading by the National Assembly in April 2024, and in an amended version by the Senate in May 2024[27]. However, the dissolution of the French National Assembly in June 2024 required the proposal to be resubmitted to the National Assembly, who has since **adopted the text on February 20, 2025.**[28] It requires application, starting in 2026.

The key measure in the proposal is to prohibit the manufacture, import and sale of certain products containing PFAS. It targets 3 categories of consumer goods:

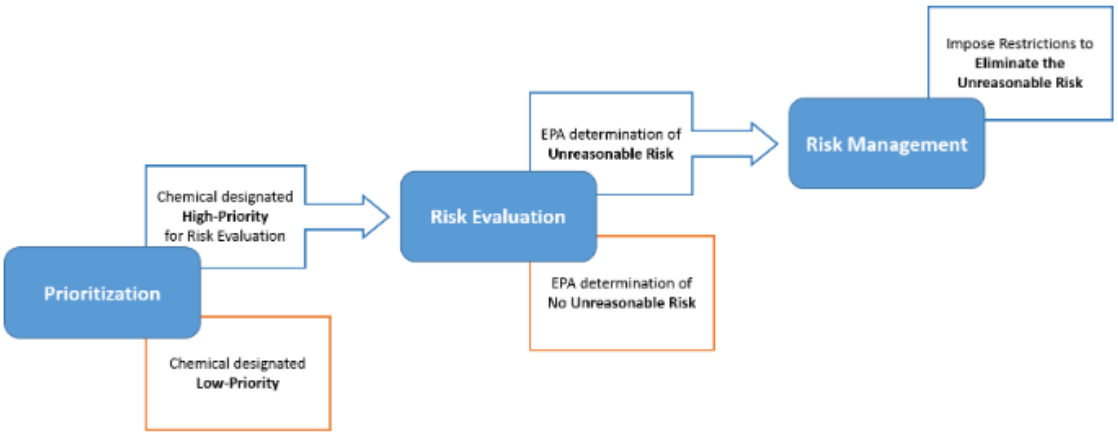
- ski waxes,
- cosmetics,
- and clothing textiles, including footwear.

Not included in the proposal are firefighter protective clothing and firefighting foam, based on the argument that their prohibition is foreseen at European level by 2027. The same applies to kitchen utensils, which are not covered by the text, implying there is no obligation to indicate the presence of PFAS in their labelling.

When the law was passed, the French Senate also added amendments, introducing **the obligation to systematically monitor the presence of PFAS in drinking water**. The objective was to go beyond what is proposed in the European directive by analysing more than 20 PFAS in drinking water annually, including mineral water.[29] The text also introduces the **obligation to follow the abatement cost of pollution** to industry according to the polluter-pays principle. However, these prohibitions would not apply if PFAS are present at "residual" levels, which should be later set by decree.

US regulation strengthening despite non-ratification of Stockholm Convention

The Unites States signed (2001) but never ratified the Stockholm Convention prohibiting three types of PFAS. Nevertheless, the Toxic Substances Control Act (TSCA), just as REACH, regulates the market entry of chemicals, and their uses. As amended by the Frank R. Lautenberg Chemical Safety for the 21st Century Act, the TSCA requires the US Environmental Protection Agency (EPA) **to evaluate the safety of existing chemicals** via a three-stage process. The three stages are **prioritization, risk evaluation, and risk management**.



Source: US Environmental Protection Agency

[26] Novethic, Polluants éternels, les députés adoptent un texte inédit pour interdire les PFAS, 2024/04/04.
[27] Le Monde, PFAS : le Sénat adopte à son tour la proposition de loi visant à restreindre l'usage des polluants éternels, 30/05/2024
[28] LCP Assemblée Nationale, Polluants éternels" : l'Assemblée adopte définitivement un texte visant à réduire l'usage des PFAS, 20/01/2025
[29] Vie publique, Proposition de loi visant à protéger la population des risques liés aux substances perfluoroalkylées et polyfluoroalkylées (PFAS), 31/05/2024

The Chemical Data Reporting (CDR) enables the EPA to collect basic exposure-related information including information on the types, quantities and uses of chemical substances produced domestically and imported into the United States. The CDR database constitutes the most comprehensive source of basic screening-level, exposure-related information on chemicals available to the EPA and is used by the Agency to protect the public from potential chemical risks.

The **information is collected every four years from manufacturers (including importers**) of certain chemicals when **production volumes for the chemical are 25,000 lbs or greater for a specific reporting year.** Collecting the information every four years assures that the EPA and the public (for non-confidential data) have access to up-to-date information on chemicals.

An unprecedented transparency requirement since January 2024

In November 2023, the EPA finalized PFAS data reporting requirements**. As of January 2024, any person or entity that has manufactured or imported PFAS - or items containing PFAS - since January 1st, 2011, will have to report it to the EPA.** Production volumes, by-products, disposal, exposures, and any data related to the environmental and/or health effects of the use of PFAS should be reported[30]. Those data points are collected and made public within the Toxics Release Inventory (TRI),[31] a tool designed to help stakeholders make informed decisions regarding toxic chemicals.

In October 2024, the EPA has proposed to add several individual PFAS chemicals and 15 PFAS categories to the reporting requirements.

Earlier in the year, in April 2024, the agency announced national drinking water standards for six types of PFAS, marking a significant step in combating PFAS contamination. The EPA provided funding via the Bipartisan Infrastructure Deal to enhance PFAS testing and treatment in public water systems.[32]

Stricter regulation also promoted by member states

There are concerns that PFAS regulations may be weakened, following the US presidential election, however, some US states and local governments are pushing for stricter regulation. As of today, 10 US states have already adopted or are in the process of adopting PFAS laws, for example:

- **California** prohibits the sale or distribution of food packaging and children's products containing "intentionally added" PFAS and imposes chemical disclosure requirements for PFAS in cookware on product labels.
- **Maine** established that by 2030, no manufacturer operating in the state will be able to sell a product containing PFAS "intentionally added". Since 2025, the manufacturers concerned have to report the use of these substances to the authorities.

The influence of industrial lobbying on PFAS regulation

The debate surrounding per- and polyfluoroalkyl substances (PFAS) is not limited to scientific considerations; it is also shaped by important lobbying efforts aimed at influencing regulatory processes. Lobbying practices can involve manipulating scientific research and the dissemination of misinformation, contributing to a climate of doubt and uncertainty regarding the potential harmful effects of PFAS.

A prime example of this dynamic is the 2022 study titled "Grouping of PFAS for Human Health Risk Assessment," funded by the American Chemistry Council (ACC). This study often cited by lobbyists, challenges the regulation of PFAS as a class, aiming to prevent comprehensive restrictions, and instead promote regulations that would focus on individual types of PFAS, less restrictive for the industry. An investigation by *Le Monde* and 29 media partners, called the "Forever Lobbying Project", revealed that

[30] EPA, TSCA Section 8(a)(7) Reporting and Recordkeeping Requirements for Perfluoroalkyl and Polyfluoroalkyl Substances, 19/12/2024
[31] EPA, Reporting for TRI Facilities, accessed 10/02/2025
[32] The Regulatory Review, Revisiting EPA's Forever Chemical Strategy, 09/01/2025

half of the experts who authored this study had financial ties to the PFAS industry, raising serious concerns about conflicts of interest and the study's objectivity. Furthermore, the panel members were not informed of the ACC's funding until after the study's conclusion, suggesting a deliberate attempt to conceal industry influence.

It can also be noted that the plastics industry has launched a campaign to oppose the proposed universal PFAS restriction proposal in Europe. The industry considers that fluoropolymers, a subgroup of PFAS, are essential and irreplaceable. Here, the “Forever Lobbying Project” points out that arguments often rely on misleading data and studies conducted by industry-affiliated researchers. For example, the claim that fluoropolymers are harmless is based on studies with significant conflicts of interest, and the "polymers of low concern" criteria they cite are not officially recognized by the OECD. In fact, the OECD has clearly stated that no set of criteria for qualifying polymers as of “low concern” has ever been finalized. The articles often cited by the industry to support this notion are written by employees of manufacturers or by consultants they contracted, raising questions about their credibility.

According to the “Forever Lobbying Project”, the manipulation of scientific information is evident in the repeated use of a limited set of studies in lobbying documents, indicating a coordinated disinformation campaign. The doubling of Plastics Europe's lobbying budget between 2020 and 2023 demonstrates the industry's commitment to influencing policy decisions. This aggressive lobbying, also uses alarmist claims, evoking massive job losses, factory closures, investment freezes, relocations, and impacts on international trade and competitiveness if stricter regulations on PFAS were to be implemented. Meanwhile, the costs of inaction in the face of PFAS pollution, estimated between 52 and 84 billion euros per year for European health systems, are not taken into account by manufacturers in their calculations.

3. Increasing litigations and growing concerns

Rising litigation costs: Potential impacts of up to USD 200 billion in the USA

An increasing number of litigations can be observed in the United States as well as in Europe. One of the most mediatized is probably the one in South Carolina, where about 1,860 personal injury cases were consolidated into a multi-district litigation (MDL). Plaintiffs allege that fire-fighting foams, AFF (aqueous film-forming foams), containing PFOA and/or PFOS, were used to extinguish liquid fuel fires near military bases, airports, and industrial sites and thus contaminated groundwater. “The plaintiffs allege that they were caused personal injury, a need for medical monitoring, property damage or other economic losses” as reported by the District of South Carolina.[33] Several companies are involved in this litigation, with settlements exceeding USD 10 billion in some cases to address PFAS drinking water contamination. Some experts predict that PFAS litigation could become the costliest in US history[34], potentially surpassing the scale of tobacco and asbestos litigation, each of which has resulted in settlements exceeding USD 200 billion. Similar legal action is underway in France, where lawsuits allege environmental contamination and related harm.

The high cost of PFAS decontamination in Europe

The collaborative investigation by *Le Monde* and 29 media partners, the “Forever Lobbying Project”, reveals the staggering potential cost of PFAS decontamination in Europe. With at least 23,000 polluted sites and as many suspected sites, the estimated cost ranges from €95 billion to €2,000 billion over 20 years. This estimate does not include the costs associated with health impacts and other negative externalities.

The lowest estimate (€95 billion) is based on a very low-probability scenario of immediate cessation of PFAS emissions and current regulatory requirements remaining unchanged, addressing only "historical" (long-chain) PFAS at the most critical sites. However, short- and ultra-short-chain PFAS, which are more mobile and difficult to treat, present a significant challenge. Trifluoroacetic acid (TFA), considered the "ultimate PFAS," is particularly concerning due to its increasing concentration and persistence. Decontaminating drinking water would require expensive technologies like reverse osmosis, unaffordable for many municipalities. According to researcher Hans Peter Arp, treating TFA is likened to desalinating oceans, and, even when effective, reverse osmosis produces PFAS concentrates that pose disposal challenges. Current water treatment plants often rely on activated carbon, effective for long-chain PFAS and some short-chain variants, but ineffective against TFA.

Destroying PFAS is complex. Only very high-temperature incinerators (above 1,050°C) are effective while conventional incinerators may exacerbate the problem by transforming long-chain PFAS into shorter chains if operated at insufficient temperatures. Research into alternative destruction methods is ongoing. Sewage sludge, often used as fertilizer, contains PFAS and contaminates agricultural land. Incinerating this sludge would cost €20 billion annually while treating wastewater treatment plants would cost at least €45 billion annually.

Given these costs, prioritization is essential, focusing on sites with the highest health risks, such as landfills (€1 million per kg of PFAS removed) and contaminated soil (at least €3 billion annually for 1,800 priority sites). Addressing TFA and other emerging PFAS would require significantly more resources, potentially reaching €2,000 billion over 20 years, or €100 billion annually, more than half the annual budget of the European Union, and these costs would be incurred "in perpetuity," unless PFAS are comprehensively restricted. In France alone, the annual cost of decontamination, including TFA treatment, is estimated at €12 billion, significantly higher than previous estimates.[35]

[33] US District Court, District of South Carolina, Aqueous Film-Forming Foams (AFFF) Products Liability Litigation MDL No. 2873, accessed 05/01/2025
[34] MGM, The current state of the PFAS litigation, 23/07/2024
[35] Le Monde, PFAS : le coût vertigineux de la dépollution de l’Europe, 14/01/2025

Opportunities for water treatment and decontamination solutions

The American Water Works Association (AWWA) estimates that PFAS remediation in the US water industry would cost approximately USD 3.8 billion annually. This includes the need for new water sources or treatment facilities for over 5,000 water systems, as well as adjustments to existing PFAS treatment systems at another 2,500 water systems in states with existing PFAS standards to comply with the new EPA rules.

In addition to the initial capital investment in new PFAS removal equipment, there will likely be ongoing requirements for operations and maintenance, including the replacement or regeneration of filtration and PFAS removal media.

Faced with growing regulations, certain companies, particularly American startups, are focusing on offering PFAS treatment technologies. Current technologies for removing PFAS from contaminated water aim to remove PFAS from the water rather than destroy them.

- **Activated carbon**, often used in filters to remove PFAS from water, particularly granular activated carbon, works by adsorbing PFAS molecules onto its surface as water is pumped through. The filters must be regularly replaced to maintain maximum efficiency, and the PFAS-loaded carbon has to be recycled and replaced every five years. This method can eliminate between 70 and 80% of PFAS, significantly reducing their presence in treated water.

- **Membranes**, as a solid porous medium, can effectively separate pollutants from a liquid or gaseous phase, and reverse osmosis (RO) and nanofiltration (NF) are suitable for separating PFAS based on their properties. However, these methods require pretreatment, such as activated carbon filtration, to prevent membrane fouling and extend their lifespan.

- **Ion exchange resins method** involves exchanging negatively charged PFAS ions dissolved in water with other anions (e.g. chlorides) integrated into a polymer resin bed through an adsorption mechanism. Resins have high adsorption capacities and effectively remove a wider range of PFAS, but the technology is less mature, and its cost is estimated to be three times higher than that of activated carbon. In France, approval from health authorities is required to use this technology.

Investor engagement: the formation of concerned investor coalitions

PFAS are not only in the scope of regulators but also investors. 60 investors, representing over USD 12 trillion under management, and including Ostrum AM since 2024, are part of the **Investor Initiative on Hazardous Chemicals (IIHC), a collaborative initiative aiming to reduce the adverse impacts of hazardous chemicals, including PFAS**, and investors' exposure to the related financial risks.

The IIHC is coordinated by ChemSec, an independent non-profit organization that advocates for substitution of toxic chemicals to safer alternatives. To ensure the transition, ChemSec provides tools to companies including the SIN List that identify chemicals of high concern and a list of the largest worldwide PFAS producers.

IIHC members engage in ongoing dialogue with the world's largest listed chemical companies. Concerns about PFAS and the chemistry sector in general are growing. IIHC seeks to address these issues, making it a relevant platform for discussion and engagement on the subject.

Engagement with companies focuses on 3 objectives:

1) **Improve transparency of information: share of revenues and volume of production coming from hazardous chemicals**;
2) **encourage companies to draft plans for the phase-out of hazardous chemicals** with specific KPIs to monitor progress in this regard;
3) **encourage companies to develop safer chemical alternatives**.

4. Ostrum's methodology to assess PFAS-related controversies

In the framework of its Worst Offenders Policy, Ostrum AM has conducted an analysis of the largest PFAS producers identified by ChemSec.[36] Ostrum AM's Worst Offenders Methodology, which is based on four criteria (proven facts, severity, systemic nature and remediation), has been widened to include PFAS. This evolution impacts the consideration of companies, potentially placing them:

- on the **Worst Offenders Exclusion List** (Group 1 (G1): companies that tick the first three criteria as per the Worst Offenders' methodology – proven facts, severity and systemic nature – and which have undertaken insufficient remediation actions);
- on the Worst Offenders **Watch List** (G2: companies that tick the first three criteria yet are in the process of ongoing remediation, thus have been put on the Watch List in order to monitor the remediation; or G3: companies that tick only one or two of the first three criteria, yet are identified as candidates that require monitoring – as they may be invested companies in the firm's portfolios and/or there is a high risk of being put on the Worst Offenders Exclusion List);
- on the **Other Controversies** List (G4: companies that do not meet the above criteria, thus companies that do not tick the first three criteria and/or companies with a satisfactory remediation).

Analysis of companies is conducted by Ostrum's Worst Offenders Working Group with decisions validated by the Worst Offenders Committee.

Proven facts	Severity	Systemic aspect	Remediation	Categorization and consequences of the analysis
✓	✓	✓	Non-existent / Insufficient	G1: Companies that tick the first 3 criteria and for which remediation measures are insufficient ->**Worst Offenders Exclusion List**
✓	✓	✓	In progress	G2: Companies that tick the first 3 criteria but for which remediation is underway ->**Worst Offenders Watch List** (remediation monitoring)
1 or 2 ✓ + ~ X			Non-existent / Insufficient In progress	G3: Companies that tick only 1 or 2 of the first 3 criteria but for which monitoring is deemed necessary (because it is present in our portfolios and/or there is a high risk of ticking the criteria of the Worst Offenders Exclusion List) ->**Worst Offenders Watch List** (general monitoring of the controversy)
3 ✓			Satisfactory	G4: Companies that do not tick the conditions of categories G1, G2 and G3 (do not tick the first 3 criteria and/or satisfactory remediation) -> **Neither the Worst Offenders Exclusion List nor the Watch List**
1 or 2 ✓ + ~ X			Non-existent / Insufficient In progress/ Satisfactory	

Source: Ostrum AM, November 2024

Stewardship is a central element for Ostrum AM, and our engagement efforts target companies where we believe that further remediation actions are possible, where we may have a significant investment and/or where company management is open to discussion. We therefore defined an exception for companies that should fall in the Worst Offenders Exclusion List but where we believe that engagement could have a positive impact. However, for each case, there is a defined escalation strategy, implying the company would be put back on the Exclusion List if the engagement does not lead to the expected results.

[36] ChemSec, ChemSec identifies the top 12 PFAS producers in the world and reveals shocking societal costs, 22/05/2023

Ostrum AM's four Worst Offenders criteria, declined for the PFAS case and used to assess PFAS producers:

Proven facts:

If 1 of the sub-criteria is validated, the criterion "proven facts" is validated: ✓
- **Results of judicial or institutional health investigations** proving the production of PFAS
- **OR recognition by the company** of PFAS production

If none of the above sub-criteria is validated, the "proven facts" criterion is not validated. x
However, the sub-criteria below make it possible to determine whether we are in a case of high suspicion: ~
- Proven product controversy = proof that the company uses or produces the product, and the product is proven to be dangerous (Chemsec classification, WHO)
- Diversity and/or seriousness of the sources that investigated, alerts reported by NGOs

Severity:

If the 2 sub-criteria are validated, the criterion "severity" is validated ✓
Proven violations (exceeding a threshold): several proven violations **OR** a single violation (exceeding a threshold) **AND** significant exceedance of the threshold to be respected.
- **AND multiple stakeholders impacted** (employees and/or customers and/or several local communities)

Systemic aspect:

If 2 of the 3 sub-criteria are validated, the "systemic character" criterion is validated ✓
- **The geographical scope of the controversy is significant**
- **Temporal Scope**: The controversy has been going on for several years
- **The company concerned was aware of the damage caused** by its activities and continued knowingly

Remediation :

If the first two sub-criteria are validated, ***then remediation is considered satisfactory, or in progress:***
- **Compensation** to affected stakeholders
- **AND PFAS Exit Plan**

If there is no PFAS exit plan, the company must validate the 3 sub-criteria below ***so that remediation is considered as satisfactory, or in progress:***
- **Compensation** to affected stakeholders
- **AND** establishment of **efficient filtration systems**, compliance with thresholds
- **AND** no existing alternative to PFAS and/or essential product; but **R&D plan** to produce the same without PFAS

Otherwise, remediation is considered insufficient, or nonexistent.

Legend: ✓ The criterion is validated ~ The criterion is not validated but there is a suspicion x The criterion is not validated

Annexes

Annex 1 – IARC monographies over PFAS

Agents Classified by the IARC Monographs, Volumes 1–135

Group 1	Carcinogenic to humans	128 agents
Group 2A	Probably carcinogenic to humans	95 agents
Group 2B	Possibly carcinogenic to humans	323 agents
Group 3	Not classifiable as to its carcinogenicity to humans	500 agents

Source: World Health Organization

CAS No.	Agent	Group	Volume	Volume publication year	Evaluation year	Additional information
1763-23-1	Perfluorooctanesulfonic acid (PFOS)	2B	135	*In prep.*	2023	
335-67-1	Perfluorooctanoic acid (PFOA)	1	110, 135	*In prep.*	2023	

Source: World Health Organization

Annex 2 – List of the 20 monitored PFAS by EU in the framework of the state monitoring

- Acide perfluorobutane sulfonique (PFBS)
- Acide perfluorohexane sulfonique (PFHxS) – also forbidden by the Stockholm Convention
- Acide perfluorooctane sulfonique (PFOS) – also forbidden by the Stockholm Convention
- Acide perfluorooctanoïque (PFOA) – also forbidden by the Stockholm Convention
- Acide perfluorononanoïque (PFNA)
- Acide perfluorodecanoïque (PFDA)
- Acide perfluoroundécanoïque (PFUnA)
- Acide perfluorododécanoïque (PFDoA)
- Acide perfluorotridecanoïque (PFTrDA)
- Acide perfluorotétradécanoïque (PFTeDA)
- Acide perfluoropentadécanoïque (PFPeDA)
- Acide perfluorohexadécanoïque (PFHxDA)
- Acide perfluorodécylbutanoïque (PFDBA)
- Acide perfluorodécylpentanoïque (PFDoPA)
- Acide perfluorotétradécylpentanoïque (PFTeDoPA)
- Acide perfluorotétradécylhexanoïque (PFTeHxA)
- Acide perfluorotétradécylbutanoïque (PFTeDBA)
- Acide perfluorotétradécylhexanoïque (PFTeHxA)
- Acide perfluorotétradécylpentanoïque (PFTeDoPA)
- Acide perfluorotétradécylhexanoïque (PFTeHxA)

Annex 3 – REACH's Candidate List explanations

The **Candidate List** is a compilation of SVHCs (Substances of Very High Concern) awaiting authorization, with intentions to propose a substance for identification published in the registry of intentions prior to submission. The proposal, prepared according to Annex XV to REACH, includes data and justification for SVHC identification, as well as information on EU market volumes, uses, and potential alternatives.

Interested parties can comment during a 45-day consultation, addressing the substance's properties, uses, and alternatives.

- If no challenging comments are received, the substance is directly added to the Candidate List, while comments on uses and alternatives are considered later in the process.
- If comments provide new information or challenge the basis for SVHC identification, they and the proposal are referred to the Member State Committee for agreement. If unanimous agreement is reached, the substance is added to the Candidate List; if not,

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