PFAS PHASE OUT

a pre-requisite for a water-resilient Europe

EurEau

Making the right choices today to safeguard our future

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Key messages

The ‘forever chemicals’ PFAS are all around us and we are exposed to them through food, water, air and skin from birth to death. Although we still face significant knowledge gaps on the impact of PFAS on human health, the increasing body of evidence on their effects is leading to drastic reductions in tolerable human exposure levels.
Due to their persistence and mobility, PFAS are increasingly found in the urban water cycle with dramatic consequences for water service providers. In order to guarantee public health, an increasing number of them have to revert to costly and unsustainable extra treatment. Moreover, our resilience is jeopardised in other sectors ranging from agriculture and energy to tourism and healthcare. End-of-pipe solutions will not and cannot solve our PFAS problems. Only a prompt and far-reaching PFAS ban can ensure that PFAS exposure in future generations will gradually approach safe levels again.
Certain uses, including in consumer products and pesticides should be stopped immediately. The polluter-pays principle should be applied to cover societal costs and stimulate innovation.

PFAS – some facts and too many unknowns

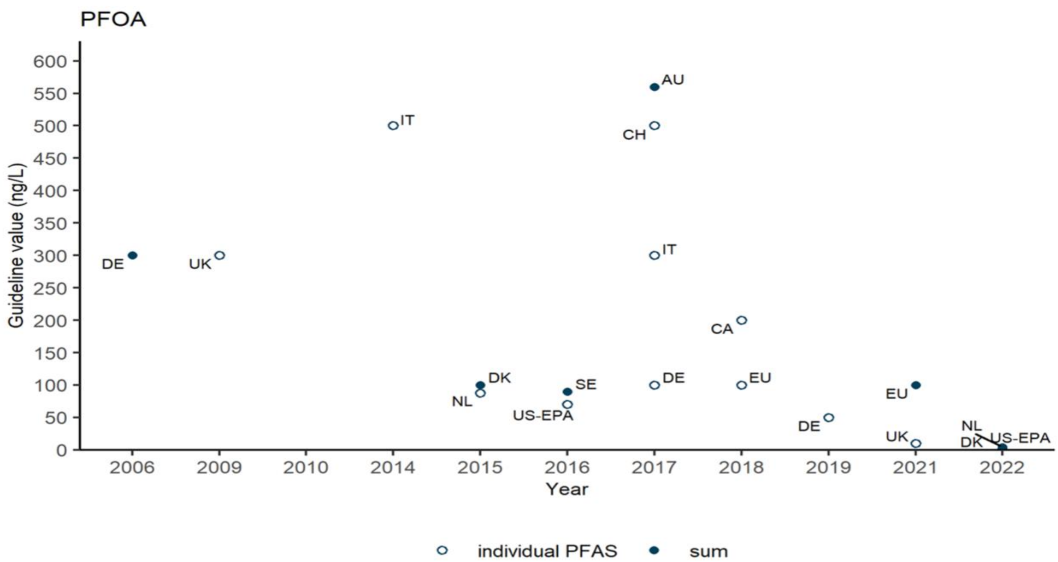
Europe's water resilience is under threat. Declining amounts of precipitation in some regions, prolonged droughts and more heavy rainstorms across the continent combined with increased demand in particular for agriculture and new industrial activities jeopardise long-term access to this valuable resource.

Apart from these quantitative aspects, water resources may not be available for use due to contamination. And here, the group of per- and polyfluoroalkyl substances (PFAS) are widely considered as a major and growing concern due to their persistence and, for many of them, their mobility.

We measure less than 1% of PFAS in the environment through targeted analysis

PFAS are all around us, in the food we eat, the water we drink, the air we breathe and the materials we are in contact with. They are making headlines in many countries when they are found in excessive levels. Still, it is estimated that **99% remain of them remain undetected in the environment** due to limits in monitoring.[1]

Out of the huge group of 6,000-10,000 individual substances, only a few are well studied and we know their **impact on human health and the environment**. For thousands of them, there is little or no data at all. The more we learn about PFAS, the more we realise that exposure levels to humans and the environment previously considered as acceptable need to be lowered, sometimes by several orders of magnitude.



Development of the exposure thresholds to PFAS.[2]

[1] emis.vito.be.
[2] KWR 2022.130 | December 2022 PFAS in Europe's water.

We know even less about the possible additional risks caused by the so-called **cocktail effect,** as people are exposed to several PFAS simultaneously, for example through foodstuff.

What we do know is that due to their intrinsic properties, these 'forever chemicals' will **continue to build up in the environment** and increasingly **pollute surface water and groundwater used for drinking water production**.

TFA in rainwater has increased fivefold over the past 20 years in Germany

A typical example of PFAS is trifluoroacetic acid (TFA), an important starting substance for the chemical industry. It is also the ultimate metabolite of many PFAS used in products such as fluorinated gases, pesticides/biocides, pharmaceuticals etc. Due to its extreme persistence and mobility, it moves from air and soil into water and plants without being stopped by natural barriers such as soil. Consequently, TFA concentrations in the aquatic environment are expected to increase further for years to come[3]. In Germany, every litre of rainwater now contains on average 335 ng/L TFA[4], a fivefold increase over 20 years[5]. The background level in surface waters in remote Swedish mountain areas are 70-100 ng TFA/L.

As to plant uptake, a recent study determined TFA concentrations in juices and drinks together with fruit/vegetable purees for small children. The average TFA concentration in orange juice was 34,000 ng/L, in apple juice 6,200 ng/L and >25 000 ng/L in two of the nine purees analysed (for samples above the limit of quantification)[6].

The European Chemicals Agency (ECHA) is currently reviewing the toxicity classification of TFA. This work will probably confirm that it takes substantially higher TFA exposure levels for toxic effects to appear compared to some long-chain PFAS (PFOA, PFOS). However, as it does not degrade in the environment, we will reach critical levels in an increasing number of water bodies, unless current emission trends are radically inversed.

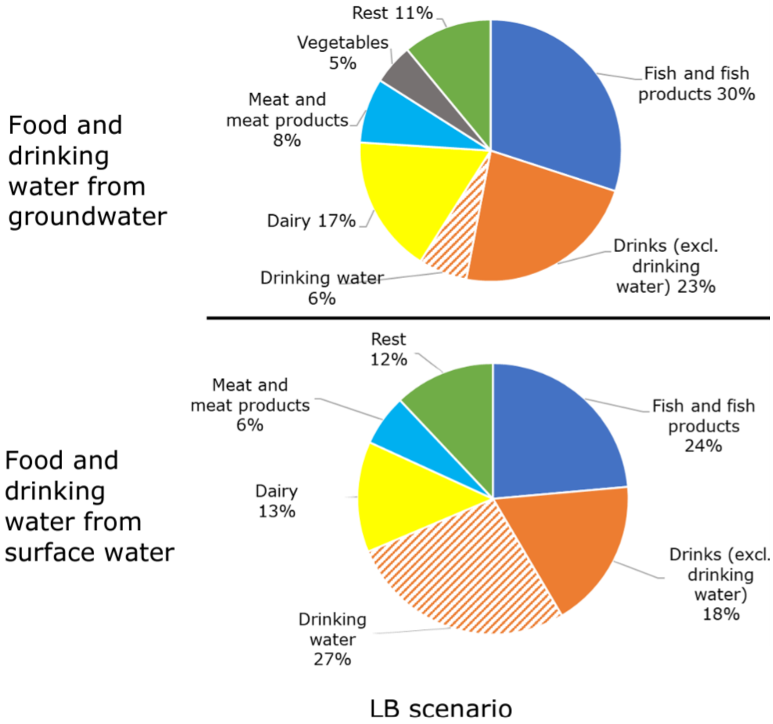
Caught in a vicious cycle

14% of teenagers exceed recommended PFAS limits in blood

Humans are exposed to PFAS from the first day of their life[7]. PFAS levels in humans usually increase with age. Therefore, it is shocking to see that more than 14% of the European teenagers already exceed the blood serum level of 6.9 µg/L for 12 PFAS, derived from the EFSA guideline value for a tolerable weekly intake of 4.4 ng/kg body weight[8].

[3] www.mdpi.com/2071-1050/16/6/2382 (chapter 3).
[4] UBA: TFA: Grundlagen für eine effektive Minimierung schaffen - Räumliche Analyse der Eintragspfade in den Wasserkreislauf (Texte 102/2023).
[5] L Hosea, R Salvidge, The Guardian: Rapidly rising levels of TFA 'forever chemical' alarm experts (2024).
[6] Eurofins White Paper: Trifluoroacetic acid (TFA) and trifluoromethane sulphonic acid (TFMS) in juice and fruit/vegetable purees, 2024.
[7] Judy S. LaKind et al, PFAS in breast milk and infant formula: A global issue, Environmental Research, Volume 219, 2023.
[8] HBM4EU Policy brief PFAS, June 2022.

While individual exposure will depend on local circumstances and diet, food is considered by far the most important PFAS intake route, followed by drinking water and smaller sources such as air and skin.



Example from the Netherlands: *Percentage contribution of drinking water and food groups that contributed to the long-term summed exposure to PFAS, expressed in PFOA equivalents for the Dutch consumer aged 1-79 years.*[1]

PFAS and drinking water

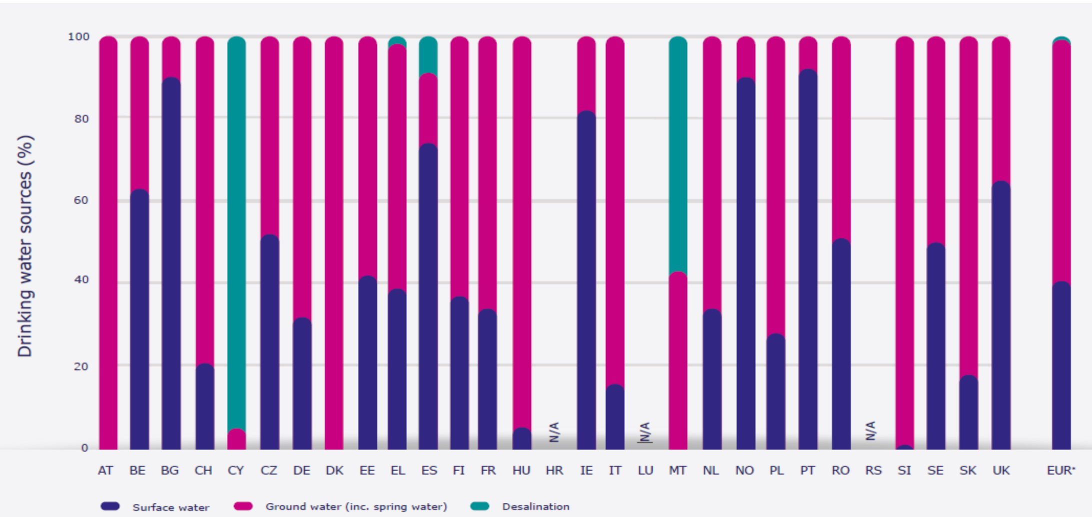
Europe's drinking water suppliers are committed to supplying safe and wholesome water to their customers at affordable prices and with the lowest environmental impact. The latter two ambitions are in danger now.

While PFAS concentrations are expected to increase in our drinking water resources, permissible concentrations in drinking water as determined in the EU's Drinking Water Directive (DWD) will be further reduced over the next few years.

Requirements of the 2020 Drinking Water Directive

- Sum of 20 PFAS: 100ng/L
- PFAS Total: 500ng/L

Proposal for revised PFAS thresholds expected in 2026.

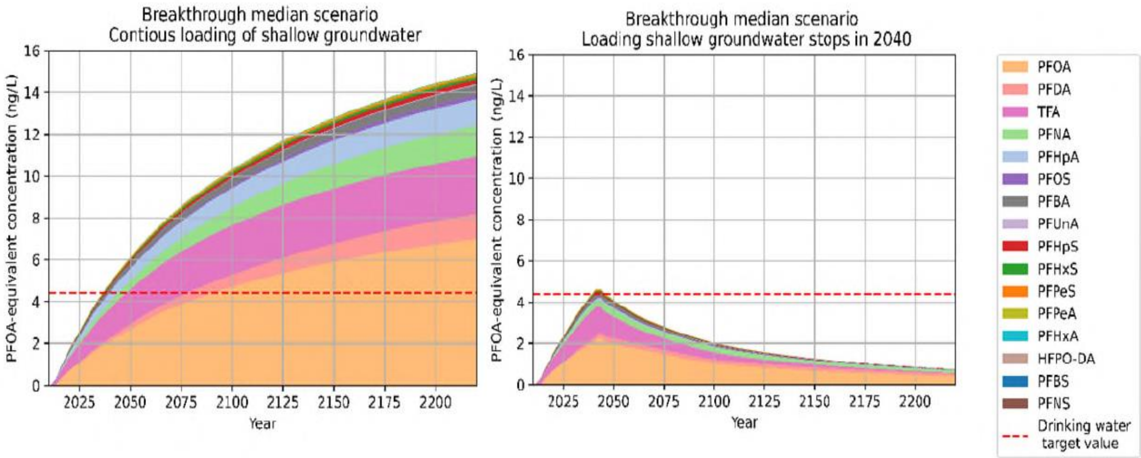


Drinking water sources (EurEau: Europe's Water in Figures, 2021)

60% of Europe's drinking water is produced from groundwater and spring water. Apart from aquifers affected by point sources (airports, fire drill sites, landfill sites, etc.), known PFAS contamination is still low and drinking water can often be supplied to consumers with minimum treatment. However, if we do not drastically reduce PFAS releases to the environment, an increasing number of shallower groundwater bodies will exceed proposed[9] European and national drinking water quality standards. Deeper groundwater bodies will remain protected for some more time but, in particular, highly mobile substances such as TFA are likely to be increasingly found.

Within 10 years, PFAS concentrations in Dutch shallow groundwater will exceed national limits

[9] Proposal for a Directive amending the Water Framework Directive, the Groundwater Directive and the Environmental Quality Standards Directive (COM, 2022).



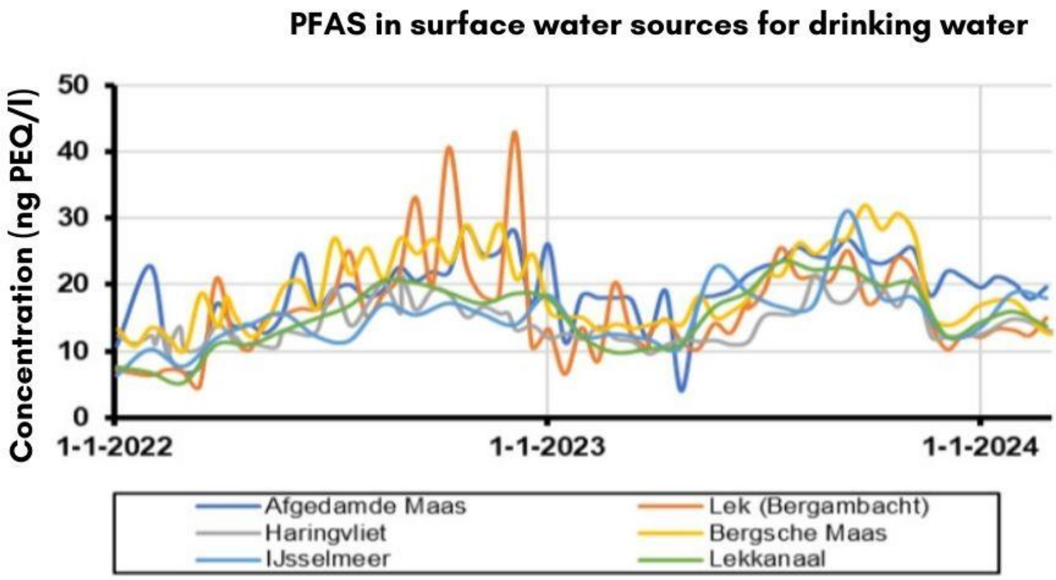
PFAS breakthrough in extracted groundwater as PFOA-equivalent concentration (PEQ) with continuous loading of the shallow groundwater (left) and stopping the load in 2040 as a result of a PFAS ban in 2025.[10]

Most of our surface water bodies have already reached PFAS concentration levels that require additional treatment before the water is safe for drinking. The announced recast of the DWD to review PFAS limit values will further increase removal requirements.

Requirement of the draft revised Environmental Quality Standards Directive (2022)

- Sum of 24 PFAS: 4.4ng/L of surface water (in PFOA equivalents).

[10] Quick Scan impact of diffuse PFAS contamination of groundwater extraction sites (kwrwater.nl), 2024.



PFAS concentration levels in various surface water bodies to the Maas River in the Netherlands

Removing PFAS from raw drinking water is more easily said than done. Commonly available technologies remove longer chain molecules albeit with a significant resource and climate footprint, but industry is moving toward shorter chain PFAS as they are often considered less toxic and are not yet subject to international (Stockholm convention) and European restrictions. The removal of short and ultrashort chain PFAS molecules such as TFA requires more advanced technologies. Such solutions may cause even higher costs, require 20% more abstracted water, be very energy intensive and create a waste (brine) that is very difficult to dispose of. It results in a chemically pure, demineralised water product that needs to be re-mineralised to meet drinking water standards. None of these solutions destroy the PFAS molecules.

This worst-case scenario could become reality for many water suppliers if ongoing reviews lead to strict TFA limit values in drinking water.

Even if we invested billions of euros in water treatment to remove PFAS, the problem of human PFAS intake would not be resolved. Intake of the long-chain PFAS 'PFOS', 'PFOA', 'PFNA' and 'PFHxS' through food is already several time higher than the EFSA recommended levels[11].

PFAS intake through food is exceeding EFSA recommended levels

PFAS and wastewater

Wastewater is a pathway of various PFAS stemming from consumer products, pharmaceuticals, industry, and rainwater run-off. Our plants have not been designed to remove such substances. Current treatment steps therefore transfer a minor part (mainly

[11] BfR. PFAS in Lebensmitteln: BfR confirms critical exposure to industrial chemicals (2021) p. 6 & Table 7.

long-chain molecules) to sewage sludge. Most other PFAS are released to the aquatic environment.

The newly approved Urban Wastewater Treatment Directive (UWWTD) does not set binding limit values for treated wastewater. Still urban wastewater treatment plants (UWWTP) may have to remove PFAS if the plant effluent represents a risk to meeting the requirements of the DWD or the Water Framework Directive/Environmental Quality Standards Directive (WFD/EQSD).

Whatever the requirements, UWWTP do not have access to technical solutions today to reliably remove PFAS. Given the complex composition of wastewater, treatment costs would be even higher than for drinking water without destroying the 'forever' molecules. Furthermore, short-chain PFAS would not be removed effectively. Wastewater operators acknowledge that they may have a role to play in a holistic societal solution. However, this is not realistic today as long as PFAS continue to be used, the polluter pays principle is not implemented and no adequate removal and destruction technologies are available. Furthermore, given the multiple pathways of PFAS to the aquatic environment, removing PFAS from wastewater would not resolve the problem.

Tremendous costs – but not for the polluters?

Determining the cost of PFAS pollution is challenging, as we cannot reliably predict future developments in terms of technologies, exposure limits, pollution levels, and raw material and energy prices. Furthermore, we have no effective technological solution today for PFAS removal from wastewater. Whatever the assumptions, the costs will be tremendous. According to the Forever Pollution Project, led by Le Monde, the water sector will face an increase of up to €18 billion per year for treating drinking water alone. The estimated cost for treating wastewater and sewage sludge management will be even higher.[12]

If PFAS use continues unabated, the drinking water sector will face an annual increase of €18 billion in treatment costs

In clear contradiction to article 191.2 TFEU, the control-at-source principle is not implemented. And what is more, the current legislative framework lets water operators and, subsequently, water users, mainly households, shoulder this cost. This is unjustifiable. In addition, the polluter-pays principle must be fully and universally implemented for any PFAS release that cannot be avoided until the PFAS ban kicks in.

The question of who should bear the cost of PFAS pollution is not only causing nightmares to those who have to pay today, but increasingly worries investors and insurers. In 2024, the Investor Initiative on Hazardous Chemicals, which represents over $10 trillion in assets under management or advice, warned the CEOs of the world's 50 largest stock-listed chemical companies of deep liability and insurance risks linked to PFAS. Production and use should be phased out[13].

[12] The Forever Pollution Project.
[13] chemsec.org.

In 2023, four PFAS producers settled court cases in the United States by agreeing to pay about $11.5 billion to contribute to the removal of PFAS from drinking water[14]. Due to different legal systems, such court cases cannot be replicated in most European countries.

Court cases are also being launched in Europe as examples from France, the Netherlands and Sweden show. However, we need solid policy that prevents PFAS pollution at the source instead of engaging in lengthy and costly legal proceedings.

PFAS – a threat to our societal resilience

No societal resilience without water resilience

There is no life without water. Public health and well-being, most economic activities and our food production depend on the availability of sufficient amounts of water in the right quality. Protecting our aquatic environment from PFAS pollution is therefore a prerequisite to achieve societal resilience.

Food security

Highly treated wastewater is increasingly used for the **irrigation of farmland** (EU Water Reuse Regulation) in many water-stressed regions. This enables agricultural activities and food production in areas where they would not be possible otherwise and hence provides a living to rural communities. However, even highly treated wastewater will not be PFAS-free.

If the risk assessment accompanying each water reuse project identifies as a significant risk for plant uptake or soil/groundwater pollution, the project may not receive a permit. The damage to the farmers concerned will be significant.

Although today's UWWTPs only remove a minor part of PFAS from wastewater, in particular, long-chain PFAS may be transferred to the sewage sludge[15]. Today, about 56% of sewage sludge is used in agriculture or for land reclamation[16]. The Commission is considering the revision of the Sewage Sludge Directive (around 2025-26) and the setting of PFAS thresholds for sludge-to-farmland applications. This logical step may exclude a part of the treated sewage sludge from recycling. Farmers benefit **from closed phosphorous, nitrogen and carbon cycles** by reducing fertiliser use from imported mineral sources. This may become impossible.

PFAS jeopardises our food security

Food security may be further affected by excessive PFAS concentrations in food.

[14] LBBW Research Financials: PFAS könnte für Versicherer Ausmaße wie Asbest annehmen, part 1 (2024).
[15] www.stowa.nl and Aquafin: The fate of PFAS throughout the WWTP process – Update (Research report KB210151.
[16] www.eureau.org.

Tourism

It may sound like a dystopic scenario, but it is already reality: Belgian and Dutch authorities advise children against playing with sea foam due to high PFAS content. In addition, Dutch authorities advise against swimming in several bathing sites due to PFAS pollution.[17]

Security and resilience

Drinking water and wastewater operators are critical entities providing essential services to society. Legislation should enable them to become largely resilient to natural and man-made crises situations. PFAS increases the sector's exposure to imports of raw materials and treatment chemicals from countries from which the EU wants to gain strategic independence.

Moreover, the water sector has the potential to become an active player in the energy markets and hence to contribute to Europe's energy independence. We can supply renewable power, heat and biogas and act as a buffer/storage to address peak demand. This role is jeopardised by the energy intensity of PFAS removal in water treatment and subsequent destruction processes.

Climate change

In line with European targets, the water sector wants to achieve climate neutrality. Some countries (Belgium (Flanders), Denmark, Sweden, United Kingdom) have set targets that are even more ambitious. PFAS thwarts these green transition ambitions.

Removing the forever chemicals from water and destroying them involves energy- and resource-intensive processes, large amounts of fossil-based materials such as activated carbon or resins, and high-temperature incineration.

Social coherence

According to the Forever Pollution Project, the water sector faces PFAS-related costs that are estimated at tens of billions, annually.

The United Nations' Right to Water definition does not only encompass access to and the quality of water and sanitation services but also their affordability.

If the polluter-pays-principle were not applied to PFAS, the full cost would fall on the shoulders of water operators. Unless governments provide support through taxpayers' money, operators would have no other choice than to pass the cost on to water consumers. As a result, the burden of the water bill on low-income households would increase substantially.

[17] www.zwemwater.nl/PFAS.

Protecting our future: overcoming the divisions

Policy makers seem to face difficult trade-offs. How much harm to people and the environment is tolerable to protect PFAS applications - some of which are highly useful for society? Which additional costs/losses for healthcare, food production, water services, tourism and soil decontamination are acceptable compared to the costs of transitioning towards a future-proof chemical industry? Should we really let the courts decide who has to bear the cost of PFAS pollution?

But perhaps these choices are not that complex after all. Clearly, claims that 'everything is under control' contradict the sheer scale of PFAS pollution we measure every day. So, things must change; quickly and drastically.

On the other hand, certain applications may be essential to society's functioning with no alternative solution available today. The European Commission's approach allows for such essential uses to be exempted from the PFAS ban until viable alternatives become available. And this is also what the European Chemicals Agency is currently doing: assessing each PFAS use, the availability of substitutes, and the transition costs.

With this in mind, EurEau calls for the following:

- **Supporting a far-reaching ban for PFAS used in products made inside and outside the EU:** Policy makers and stakeholders should support the ECHA 'universal PFAS restriction' process and the European Commission should add the restriction to annex XVII of the REACH Regulation without undue delay. We simply cannot afford continued PFAS emissions to the aquatic environment.
- **Prolonging PFAS use only in certain essential applications for a limited time:** Some PFAS uses, for example in medical applications, might be essential for people's health. In line with the Commission's approach, these applications might enjoy longer transition periods, provided PFAS release to the environment is minimised and the end of life management is subject to strict certification. With a view to protecting our drinking water, the WHO advises its member countries that "all non-essential uses of PFAS should be stopped"[18].
- **Banning PFAS in fire-fighting foams:** ECHA transmitted its proposal for a group restriction for PFAS in fire-fighting foams to the European Commission in 2023. The latter should, without further delay, publish the restriction in annex XVII of the REACH regulation, applying the shortest possible transition periods. Fire-fighting foams have caused dramatic local PFAS pollution across our continent and alternatives are available.
- **Tackling PFAS in plant protection products:** The European Commission should immediately withdraw the authorisation for all PFAS–containing plant protection products and biocides, and in particular those that lead to the formation of TFA. Available data suggest that their use is leading to the accumulation of this substance in soil and groundwater.

[18] www.who.int.

- **Setting health-derived limit values for PFAS including TFA** in drinking water and food accompanied by strict control-at-source measures to avoid PFAS release to the environment.
- **Providing long-term framework:** Regulation drives innovation. Only a clear phase-out date, possibly, supplemented by a short transition period, provides the regulatory framework that stimulates investment in alternative solutions. PFAS are increasingly restricted in other parts of the world. Europe can become a forerunner in developing PFAS-free alternatives.
- **Making the polluter pay:** PFAS pollution costs billions of euros every year. These costs are today borne by water operators, municipalities, health insurances, governments and others. By incorporating these costs in the PFAS price, we will not only bring fairness to the protection of people and the environment, but also make alternative, more sustainable solutions more competitive. Public authorities should provide complementary financing.
- **Promote innovation:** The EU's research programmes should support the development of adequate and more sustainable PFAS substitutes and PFAS removal and destruction technologies.

About EurEau

EurEau represents Europe's drinking and wastewater sector. We encompass 38 national water services associations including public and private operators from 33 countries.

Together we promote access to safe and reliable water services for Europe's citizens and businesses, the management of water quality and resource efficiency through effective environmental protection.