



Investing in Alternatives to Pervasive, Persistent and Profitable PFAS



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Executive Summary

Per-and-polyfluoroalkyl substances (PFAS) have emerged as a global health and environmental concern, with studies showing that nearly 99% of Americans carry PFAS in their bloodstream. PFAS are cheap, high-performance substances difficult to destroy or substitute; therefore, the landscape of destruction and substitution approaches is small and nascent. This indicates a need for additional capital for accelerators, seed, and venture companies. Investors with some risk appetite will find the readiest opportunities at those stages, though there are also sporadic chances to use capital to expand production capacity. Additional non-dilutive support from government and philanthropy can support needed R&D and help the ecosystem flourish.

Regulation is a prominent consideration for financial returns, as the regulatory gap presents strategic opportunities and challenges for investors. Linked to cancer and other serious health effects, PFAS are facing increasing regulatory scrutiny. Yet regulatory action remains fragmented and slow-moving, particularly in the United States, where state-level policies vary widely and national standards are still evolving.

Europe leads the global regulatory response, proposing broad bans and promoting alternatives in select sectors. However, many end-use applications remain exempt due to the lack of viable substitutes.

The companies developing PFAS-free technologies face challenges in scaling and competing with incumbents. There is good reason to believe demand growth will help, either driven by consumers themselves or consumer-oriented corporates managing supply chains. The timeline for regulatory and demand effects is uncertain, in part because evidence of health and environmental exposure impacts is still accumulating. Nevertheless, funding PFAS-free solutions not only aligns with environmental and social priorities but positions investors to benefit from long-term regulatory tailwinds and rising demand for sustainable materials.

Table of Contents

| | |
|--|-----------|
| Executive Summary | ii |
| 1 Introducing PFAS | 1 |
| 1.1 Scoping the PFAS challenge | 1 |
| 1.2 The Accidental Discovery | 1 |
| 1.3 Market Overview | 2 |
| 1.4 Exposure to PFAS | 3 |
| 1.5 Accumulation | 3 |
| 1.6 Health effects of PFAS..... | 4 |
| 2 PFAS regulatory environment | 6 |
| 2.1 Regulations on consumer products | 6 |
| 2.2 Regulations on PFAS in water | 7 |
| 3 Substitution potential for alternatives | 8 |
| 3.1 PFAS substitution potential across markets | 8 |
| 3.2 Understanding low substitution potential end-uses..... | 8 |
| 4 Investing in alternatives to PFAS | 10 |
| 4.1 PFAS investment strategy | 11 |
| 4.2 PFAS investment strategy: Textile industry case study | 11 |
| 4.3 PFAS investments strategy: Electronics industry case study | 12 |
| 4.4 PFAS investments into water mitigation | 12 |
| 5 Conclusion | 15 |
| References | 16 |

List of Figures

| | |
|---|----|
| Figure 1: Three areas to potentially influence PFAS replacement..... | 1 |
| Figure 2: Global PFAS market value 2023 by application | 2 |
| Figure 3: Substitution potential for PFAS End-use Applications | 8 |
| Figure 4: Market map of companies offering PFAS-free alternatives | 10 |
| Figure 5: Funding rounds for PFAS alternatives | 11 |
| Figure 6 PFAS water mitigation technology readiness levels | 13 |
| Figure 7: PFAS water mitigation market map | 13 |
| Figure 8: Funding rounds for PFAS water treatment | 14 |

List of Tables

| | |
|---|---|
| Table 1: Health effects from PFAS exposure..... | 5 |
| Table 2: U.S. States PFAS regulation end-uses focuses | 6 |

1 Introducing PFAS

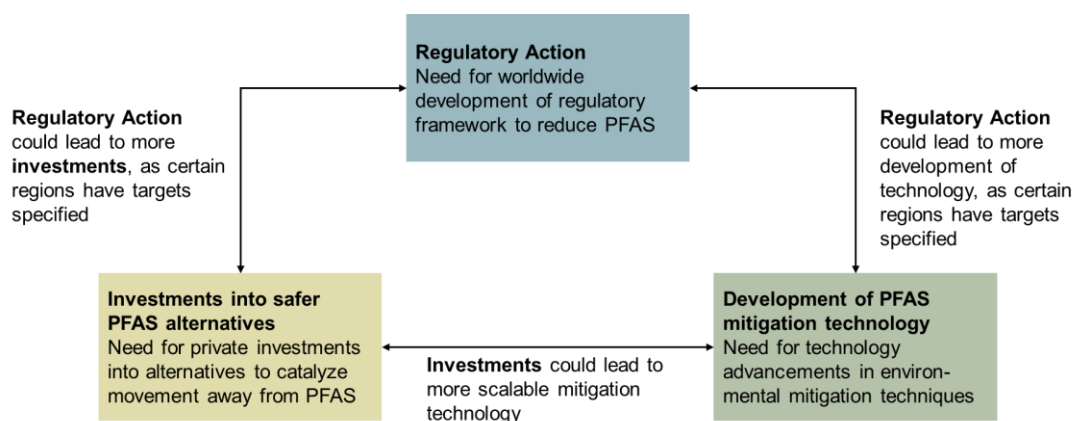
1.1 Scoping the PFAS challenge

PFAS, once celebrated for their durability, now represent a financial, regulatory, and reputational liability. With residues detected across air, soil, water, food, and even in human bloodstreams, PFAS have been under scrutiny since the 1970s. Yet despite decades of discussion, industry has barely slowed.

The financial stakes are already significant with more than \$15 billion paid in damages by chemical manufacturers, while global water system remediation is projected at \$400 billion.¹ But liability is only one side of the story, as demand for PFAS alternatives and destruction technologies is accelerating.

CREO's analysis highlights three converging forces that will shape the market transition away from PFAS: regulatory enforcement, technical innovation, and targeted capital deployment. These forces indicate where existing assets risk becoming liabilities, and where capital can be deployed to capture the next wave of market opportunities.

Figure 1: Three areas to potentially influence PFAS replacement



1.2 The Accidental Discovery

PFAS has existed for nearly a century, with the chemical's first form, polychlorotrifluoroethylene (PCTFE) discovered by Fritz Schloffer and Otto Scherer in 1934 at the former German chemical conglomerate, IG Farben. However, PCTFE was only the introduction to the forever chemical.

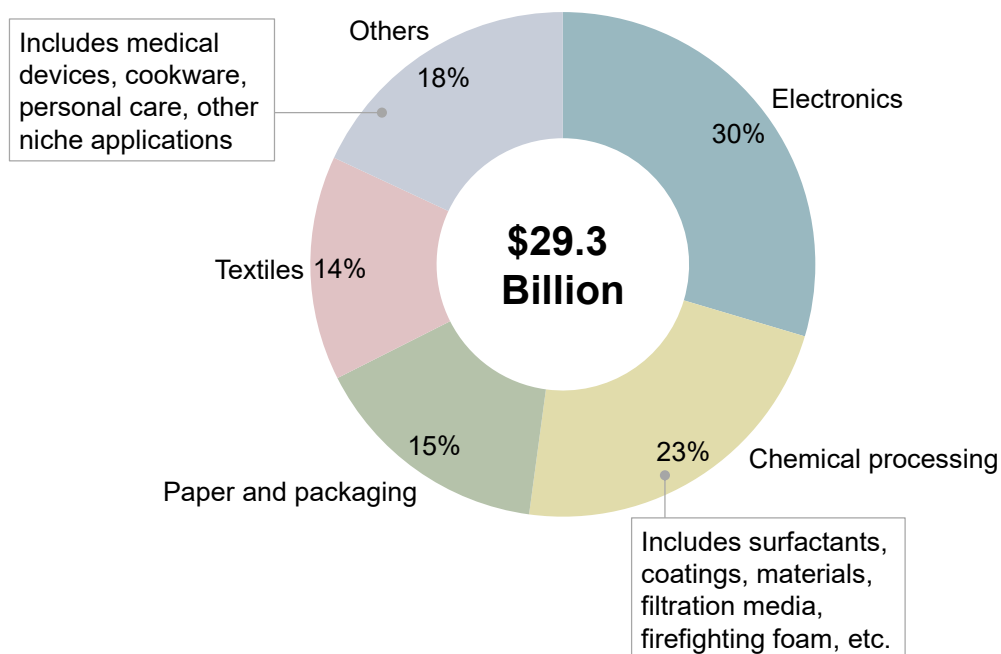
In 1938, Roy J. Plunkett was assigned by DuPont to develop a new alternative to existing fluorocarbon-based refrigerants. While working on the project, Plunkett and his assistant accidentally discovered a frozen, compressed sample that had spontaneously formed a white, waxy solid, polytetrafluoroethylene (PTFE), more commonly known as Teflon.

Within two decades of its initial discovery in 1934, PFAS shifted from niche use in wartime projects to widespread adoption in cookware, coatings, and industrial processes. Today, there are more than 14,000 variants that exist.²

1.3 Market Overview

The global PFAS market is currently valued at \$29.3 billion+³ where PFAS is integrated across every major industrial and consumer market. While PFAS are widely recognized for their use in cookware and firefighting foams, their strategic importance extends far beyond these categories. PFAS play a critical role in high-value applications including semiconductors and electronics, chemical processing, food packaging, textiles, medical devices, and personal care products.

Figure 2: Global PFAS market value 2023 by application



Semiconductors and electronics account for the majority of the PFAS market, at \$8.7 billion. PFAS compounds are used as laminate materials due to flame-retardant and dielectric properties. Additionally, they are applied as protective coatings to safeguard sensitive electronic components from thermal stress, moisture, and particulate contamination.

Chemical processing makes up the second largest segment for PFAS at \$6.6 billion, and is utilized as surfactants, coatings, structural materials, and filtration media, contributing to process efficiency and product durability in industrial chemical operations. PFAS in paper and packaging are primarily used as grease- and water-resistant coatings, particularly in single-use and take-away containers. In textiles, PFAS enhances performance by imparting resistance to water, oil, and stains; features critical to both consumer apparel and industrial fabrics. PFAS are also present in cosmetics and personal care formulations, medical devices and implants, and niche consumer products such as nonstick cookware. These diverse applications reflect the chemical’s versatility and entrenched role in modern manufacturing.

Japan, the United States, and China are currently the leading markets for PFAS-based commercial applications. Patent activity and product innovation in these regions indicate sustained demand and technological advancement.⁴ However, global regulatory scrutiny is intensifying. Many countries are actively curbing PFAS usage due to environmental and health concerns, with notable exceptions being China and South Korea, where commercial deployment continues to expand.

1.4 Exposure to PFAS

The widespread production and extensive industrial use of PFAS, coupled with the ability to move and persist in the environment, have led to pervasive environmental and human exposure. Nearly 99% of residents in the United States have detectable levels of PFAS in their bloodstream, reflecting the toxins' deep penetration into everyday life.⁵

PFAS exposure is not just limited to the variety of consumer end-use products available. Humans are exposed to PFAS through the air, water, soil, and even through food consumed.

PFAS can be cycled through our ecosystem through PFAS production facilities, landfills, and our own homes and offices. PFAS production or using industry release-treated wastewater discharges to the stream, leading to bioaccumulation and food-chain interactions. These facilities also pollute the air, affecting the air we breathe in. Landfills send leachate to wastewater treatment plants and in turn the discharge from these plants impacts the streams. Food and household products in homes and offices can infiltrate into groundwater and further lead to contaminated drinking water.⁶

Compounds such as PFOA, PFOS, and PFNA are water-soluble, making contaminated drinking water a primary route of exposure. Notably, conventional water treatment methods such as boiling are ineffective at removing PFAS, posing a challenge for mitigation at the consumer level.⁷ The only positive aspect is exposure to PFAS from showering, bathing, laundry, and dishwashing is not significant.

1.5 Accumulation

The accumulation and health impact of PFAS vary significantly across demographic groups, with exposure levels influenced by occupation, geography, and physiological vulnerability. For example, adults may experience elevated PFAS exposure due to occupational hazards or proximity to PFAS-producing or PFAS-utilizing facilities. Industrial workers and residents in manufacturing zones are particularly susceptible to higher exposure to PFAS, in turn creating adverse health effects associated with the chemicals.⁸

Children represent a high-risk population due to both behavioral and physiological factors. Their higher intake of water and food relative to body weight, combined with crawling and mouthing objects, increases their exposure potential. Moreover, PFAS can also be transmitted from mother to child via breast milk and in utero during pregnancy, raising concerns about long-term health effects.⁹

Recognizing the health risks, numerous states in the United States and the Environmental Protection Agency (EPA) have established maximum contaminant levels (MCL) for PFAS in public drinking water systems. These standards aim to limit exposure and guide municipal water treatment protocols.

However, mitigation remains a formidable challenge. PFAS removal technologies are still in development, and current solutions are costly and limited in scalability. EPA researchers have been studying a variety of technologies at bench-, pilot-, and full-scale levels to determine which methods work best to remove PFAS from drinking water.⁹

1.6 Health effects of PFAS

Emerging scientific research continues to link exposure to PFAS with a range of adverse health outcomes. Research has suspected health effects including increased risk of kidney and testicular cancers, reduced fertility, hormonal disruption, liver disease, immune system dysfunction, and more. These findings are primarily based on studies of two well-characterized PFAS compounds: PFOA and PFOS. However, the vast majority of the estimated 14,000+ PFAS variants remain largely unstudied, leaving significant gaps in toxicological understanding.¹⁰

Despite the mounting evidence, regulatory agencies face challenges in quantifying the full spectrum of PFAS-related health impacts. For instance, the United States EPA has recently concluded it could not quantify immune system, hepatic, endocrine, metabolic, reproductive, musculoskeletal, or other effects in its economic analysis for establishing PFAS maximum contaminant levels (MCLs).¹¹ This limitation underscores the complexity of assessing long-term health risks and the need for expanded research and surveillance.

Other international groups such as the International Agency for Research on Cancer (IARC) have already classified PFOA as carcinogenic to humans and PFOS was evaluated as possibly carcinogenic to humans; based on all the evidence it can cause cancer in lab animals and strong evidence that it has some of the key properties of a carcinogen in people who are exposed to it.¹²

The European Environmental Bureau (EEB) has called for urgent European Union (EU)-level intervention to address PFAS pollution. In a public statement, the EEB's Secretary General emphasized the long-standing awareness among producers of PFAS-related health risks and warned of escalating costs associated with regulatory inaction. The call to "hold polluters accountable" reflects growing public and institutional pressure to accelerate policy reform and environmental remediation.¹³

For investors, heightened awareness of PFAS health risks, especially among children and adults, signals a rising risk and emerging opportunity. Companies tied to PFAS are facing growing liability, compliance costs, and reputational exposure as agencies like the EPA and IARC are tightening standards and classifying key PFAS compounds as carcinogenic. However, investors can tap into avenues such as mitigation technology and firms offering PFAS-free materials, which are positioned for growth, as a replacement for the toxin.

Table 1: Health effects from PFAS exposure

| | ✓ High certainty | ✓ Low certainty |
|---|-----------------------------|-----------------|
| | <u>Certainty of Effects</u> | |
| Delayed mammary gland development | ✓ | ✓ |
| Reduced response to vaccines | ✓ | ✓ |
| Lower birth weight | ✓ | ✓ |
| Obesity | ✓ | ✓ |
| Early puberty onset | ✓ | ✓ |
| Increased miscarriage risk (i.e., pregnancy loss) | ✓ | ✓ |
| Low sperm count and mobility | ✓ | ✓ |
| Thyroid disease | ✓ | ✓ |
| Increased cholesterol levels | ✓ | ✓ |
| Breast cancer | ✓ | ✓ |
| Liver damage | ✓ | ✓ |
| Kidney cancer | ✓ | ✓ |
| Inflammatory bowel disease (ulcerative colitis) | ✓ | ✓ |
| Testicular cancer | ✓ | ✓ |
| Increased time to pregnancy | ✓ | ✓ |
| Pregnancy induced hypertension/pre-eclampsia (increased blood pressure) | ✓ | ✓ |

2 PFAS regulatory environment

Efforts to reduce or eliminate PFAS from consumer products and the environment have led to an evolving regulatory framework. However, PFAS regulation remains fragmented across jurisdictions, varying by region, end-use sector, and even national governance.

2.1 Regulations on consumer products

The EU currently leads global regulatory efforts with the most comprehensive and stringent PFAS restrictions. The European Chemicals Agency (ECHA) has proposed a sweeping ban on PFAS as a chemical class, targeting sectors where viable substitutes exist, such as textiles, food packaging, and cosmetics. Derogations of 5 to 12 years are expected for industries lacking proven alternatives, including metal plating, fluorinated gases, medical devices, electronics, semiconductors, and mining.¹⁴ With many backlashes over the lack of available substitutes to niche applications of PFAS, ECHA's reviewed these comments and have led to identification of certain sectors that are expected to have restrictions. ECHA's scientific assessment is scheduled to conclude in 2026, with final recommendations to be submitted to the European Commission. If adopted, the regulation could cover over 90% of PFAS emissions and volumes.¹⁵

The EU also enforces the Stockholm Convention on Persistent Organic Pollutants, which is a global treaty that includes PFOS, PFOA, and PFHxS. Exceptions are granted for critical applications such as medical implants.¹⁶ While the United States signed the convention in 2001, it has not ratified it and participates only as an observer and in technical working groups.¹⁷

In the United States, PFAS regulation is decentralized, with 26 states implementing policies targeting specific end-uses. Firefighting foam is the most regulated product, followed by paper packaging and textiles.¹⁸ However, exemptions persist for sectors such as consumer electronics, semiconductors, motor vehicles, and medical devices. This patchwork approach creates compliance variability and operational complexity for manufacturers and distributors.

Table 2: U.S. States PFAS regulation end-uses focuses

| States | Chemical processing | | | | | | Other Personal Care products | Proposed solution |
|---------------|------------------------|----------------------|----------------------|----------|----------------------|----------|------------------------------------|---|
| | Children's products | Cleaning products | Firefighting foam | Plastics | Paper & packaging | Textiles | | |
| Alaska | | | ✓ | | | | | Phasing out |
| Arizona | | | ✓ | | | | | Phasing out |
| California | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | Phasing out, accountability, transparency |
| Colorado | | | ✓ | | ✓ | ✓ | ✓ | Phasing out |
| Connecticut | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | Transparency, phasing out |
| Delaware | | | ✓ | | | | | Accountability |
| Georgia | | | ✓ | | | | | Phasing out |
| Hawaii | | | ✓ | | ✓ | | | Phasing out |
| Illinois | ✓ | | ✓ | | ✓ | ✓ | ✓ | Phasing out, setting the stage |
| Indiana | | | ✓ | | | | | Phasing out |
| Kentucky | | | ✓ | | | | | Phasing out |
| Louisiana | | | ✓ | | | | | Phasing out |
| Maine | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | Phasing out, transparency |
| Maryland | ✓ | | ✓ | | ✓ | ✓ | ✓ | Phasing out, transparency |
| Michigan | | | ✓ | | | | | Phasing out |
| Minnesota | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | Transparency, accountability, phasing out |
| Nevada | ✓ | | ✓ | | | ✓ | | Phasing out |
| New Hampshire | | | ✓ | | | | | Phasing out |
| New Jersey | | | ✓ | | | | | Phasing out |
| New Mexico | | | ✓ | | ✓ | ✓ | ✓ | Phasing out |
| New York | ✓ | | ✓ | | ✓ | ✓ | | Phasing out |
| Oregon | ✓ | | ✓ | ✓ | ✓ | | ✓ | Phasing out, transparency |
| Rhode Island | | | | | ✓ | | | Phasing out |
| Vermont | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Phasing out, setting the stage |
| Washington | | | ✓ | | ✓ | ✓ | ✓ | Phasing out |
| Wisconsin | | | ✓ | | | | | Phasing out |

Other jurisdictions are also advancing PFAS regulation. Australia and Japan combine Stockholm Convention commitments with evolving domestic policies. New Zealand has taken a more aggressive stance, banning PFOS and PFOA outright since 2020 and planning phased bans on PFAS in firefighting foam and cosmetics by 2025 and 2026, respectively.

2.2 Regulations on PFAS in water

PFAS contamination in water supplies has become a focal point of regulatory action. The EU's Water Framework Directive (WFD) mandates member states to monitor priority substances and achieve "good chemical status" for all water bodies by 2027. PFOS is listed as a priority substance and member states have been required to report on compliance since 2021. The EQS for PFOS is currently 0.65 nanograms of PFOS per liter for inland surface waters; 0.13 nanograms of PFOS per liter for transitional, coastal, and territorial waters; and 9.1 micrograms of PFOS per kilogram wet weight for fish.¹⁹

In the United States, the EPA initially proposed National Primary Drinking Water Regulations (NPDWR) for six PFAS compounds, including PFOA, PFOS, PFHxS, PFNA, and GenX. Legally enforceable maximum contaminant levels (MCL) were established, but recent political shifts have led to regulatory retrenchment. As of May 2025, the EPA announced it would maintain existing MCLs for PFOA and PFOS while, unfortunately, the EPA has also announced its intent to rescind the regulations and reconsider regulatory framework for PFHxS, PFNA, and GenX.

Despite federal uncertainty, the EPA requires public water systems to begin PFAS monitoring by 2027, with full compliance and mitigation measures expected by 2029. If systems violate one or more of these MCLs, the system must take further action to mitigate damages and provide notification to the public.²⁰ Aside from federal action, 11 states—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, Wisconsin, Michigan, and Washington—have already set their own limits on PFAS in drinking water, with additional states pursuing similar measures.

The tightening global regulatory environment around PFAS presents both operational challenges and strategic opportunities for investors. Companies operating in jurisdictions with aggressive PFAS restrictions, such as the EU and select U.S. states, face rising compliance costs, product pressures, and potential market access limitations. However, the lack of regulatory harmonization across regions, nations, and states complicates supply-chain management for multinational firms. Investors are recommended to prioritize exposure to companies aligned with emerging standards or capable of adapting to dynamic compliance landscapes, as firms developing PFAS-free materials are positioned to benefit from regulatory tailwinds and growing demand for safer alternatives.

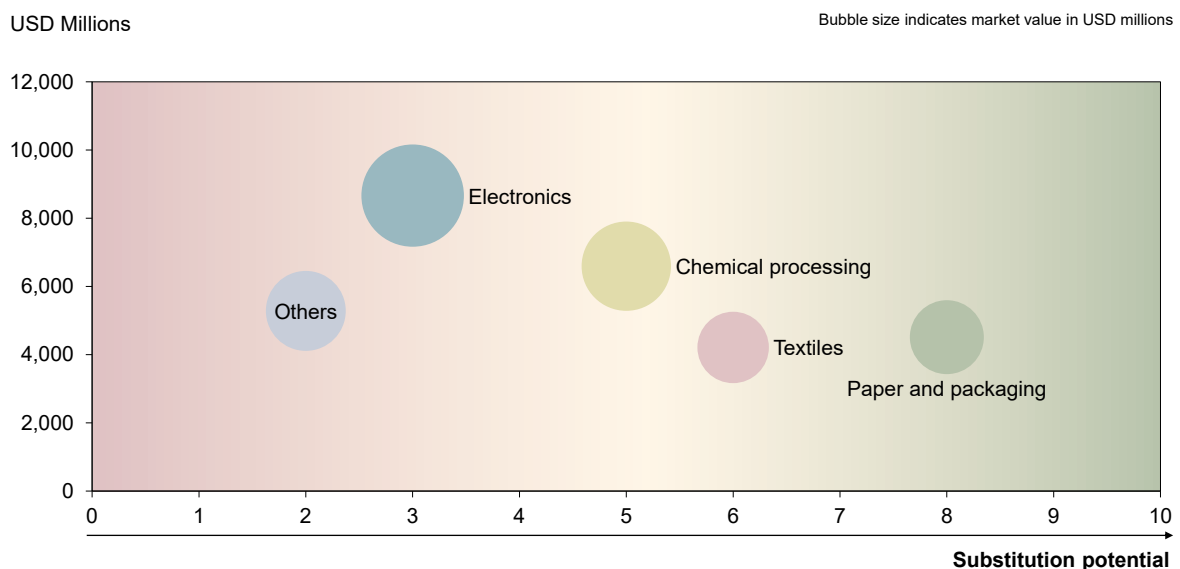
3 Substitution potential for alternatives

3.1 PFAS substitution potential across markets

As global regulations accelerate the push to reduce or eliminate PFAS, the substitution potential across end-use markets presents both investment opportunities and structural limitations. While certain sectors offer viable pathways for PFAS phaseout, others are dependent on the chemical's unique properties, requiring long-term innovation and strategic capital deployment.

Many PFAS markets have a higher substitution potential, such as firefighter foam, paper and packaging, textiles or other end-uses such as cosmetics, and nonstick pans. These sectors are actively exploring and adopting PFAS-free alternatives, supported by regulation and growing consumer demand for safer products. Investment in material science, sustainable chemistry, and supply-chain transformation in these areas is expected to yield near-term returns. Conversely, sectors such as semiconductors, electronic devices, and medical implants present significant challenges for PFAS replacement.²¹

Figure 3: Substitution potential for PFAS End-use Applications



3.2 Understanding low substitution potential end-uses

Successful phaseout requires material innovations, process changes, and new technologies, not just chemical replacements.

Semiconductors and electronic components typically utilize PCTFE as laminate material for flame retardants and dielectric properties or even applied to the finished product as a protective layer to protect the equipment against temperature, moisture, and dust.

Typical products PFAS are used in are printed circuit boards, capacitors, acoustic equipment, liquid-crystal displays (LCD), flat-panel displays, wiring and cables, solar panels, fuel cells, lithium-ion batteries, smartphones, and tablets, etc. Other electronic devices such as switches, cleaners, coffee makers, and keyboards, also utilize PFAS in their products. Unfortunately, many electronic devices have limited commercial options to be PFAS-free.

Even in the absence of regulatory mandates, several leading electronics manufacturers have proactively initiated efforts to reduce or eliminate PFAS from their products. Apple has been at the forefront of voluntary PFAS phaseout. The company restricted the use of PFOA and PFOS in 2010 and 2013, respectively, and expanded its restrictions in 2021 to include PFCA compounds, PFHxS, and related substances. Apple's approach began with comprehensive chemical inventory disclosures, followed by collaboration with suppliers and academic institutions to identify non-PFAS alternatives that meet stringent performance requirements for critical applications.²²

In 2024, Apple further demonstrated its commitment by providing seed funding for the Safer Chemistry Investment Fund, aiming to raise \$15 million over five years to accelerate the industry's transition to safer materials. While Apple's leadership signals a strategic shift, the company has not publicly detailed the specific substitute materials used in its electronics, reflecting a broader industry trend of limited visibility into PFAS replacement strategies. Although materials such as PEEK, PVDF, and silicone-based coatings are often cited as potential alternatives, their adoption remains undocumented in public filings or product specifications.

Like Apple, Intel also has a roadmap for PFAS replacement and is looking at research efforts to identify replacements by accelerating R&D. Nvidia's networking products have already received compliance certificates for being free of PFOS, PFOA, PFCA, and PFHXS.²³ Other companies such as 3M have committed to stopping using PFAS by 2025. However, 3M will not investigate third-party participants and the usage of PFAS in their processes. IBM reported that it will adopt Accelerated Discovery methods to substitute PFAS use gradually.

In medical devices, substitution is even more constrained. The U.S. Food and Drug Administration (FDA) maintains that fluoropolymers used in devices such as catheters, pacemakers, surgical sutures, and radiological equipment have a long history of safe use and currently lack viable alternatives. These materials offer essential properties including biostability, lubrication, and electrical insulation.

In Europe, the story differs as many healthcare professionals spanning more than 12 countries are calling for the European Commission officials to phase out PFAS in the healthcare sector. Professionals emphasize their concerns that PFAS exposure may be contributing to such diseases in their patients, stating there are many alternatives already available on the market. For example, Hydromer replaced PFAS in medical device coatings with PFAS-free hydrophilic coatings. Victrex developed PFAS-free polyether ether ketone (PEEK) polymers for medical applications. PEEK is typically known for its strength, chemical resistance, and high thermal stability, making it ideal for PFAS-based materials.²⁴

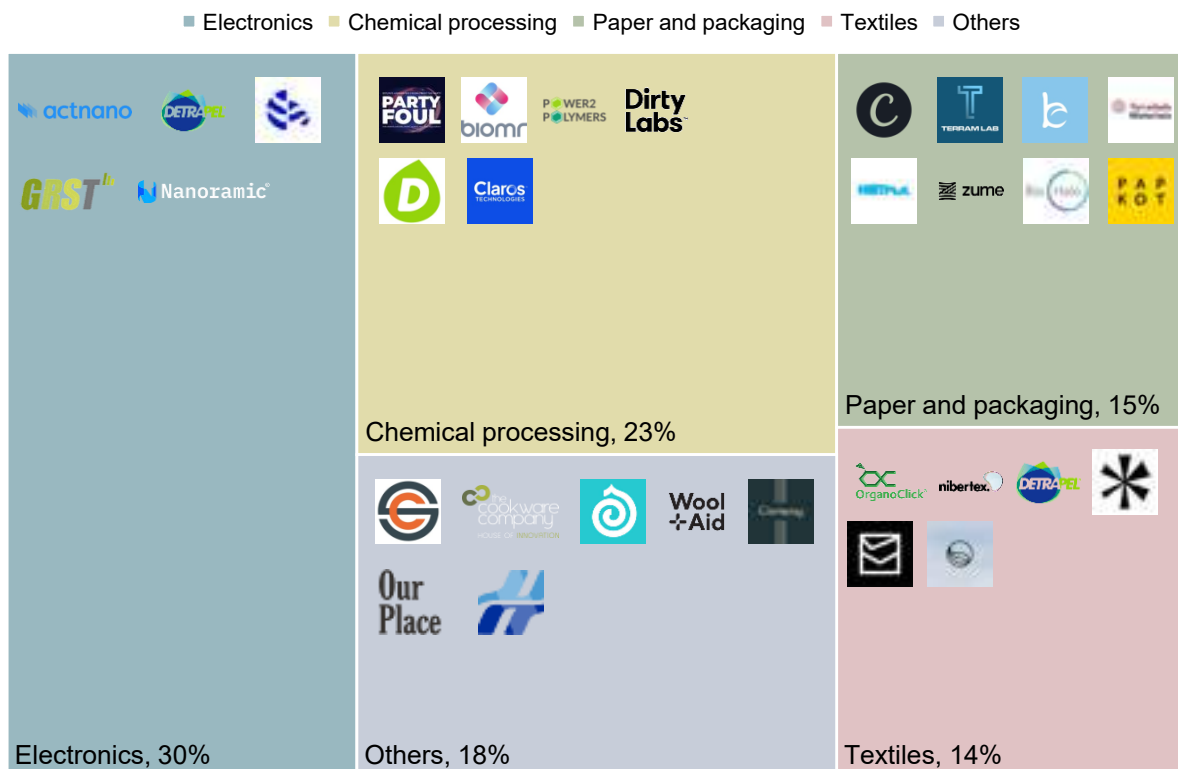
Investors can monitor R&D pipelines, supplier engagement, and regulatory shifts to identify firms positioned for leadership in PFAS-free innovation. Strategic capital allocation toward materials science and sustainable manufacturing will be key to navigating this transition.

4 Investing in alternatives to PFAS

While regulatory efforts and substitution potential are gradually advancing the transition away from PFAS, meaningful market transformation will require substantial private investment. CREO suggests that the most impactful drivers of change lie in funding PFAS-free alternatives and mitigation technologies, particularly in sectors where substitution remains technically challenging.

Currently, the landscape is dominated by early-stage startups focused on PFAS-free technologies. Many of the up-and-coming startups looking for funding are more focused in certain regions where regulations are far more restricted, like Europe, than North America. However, funding remains disproportionately low relative to the scale of the challenge, with most of the funding through grants and seed-stage capital.²⁵ This total capitalization falls far short of the investment required to drive systemic changes across industries.

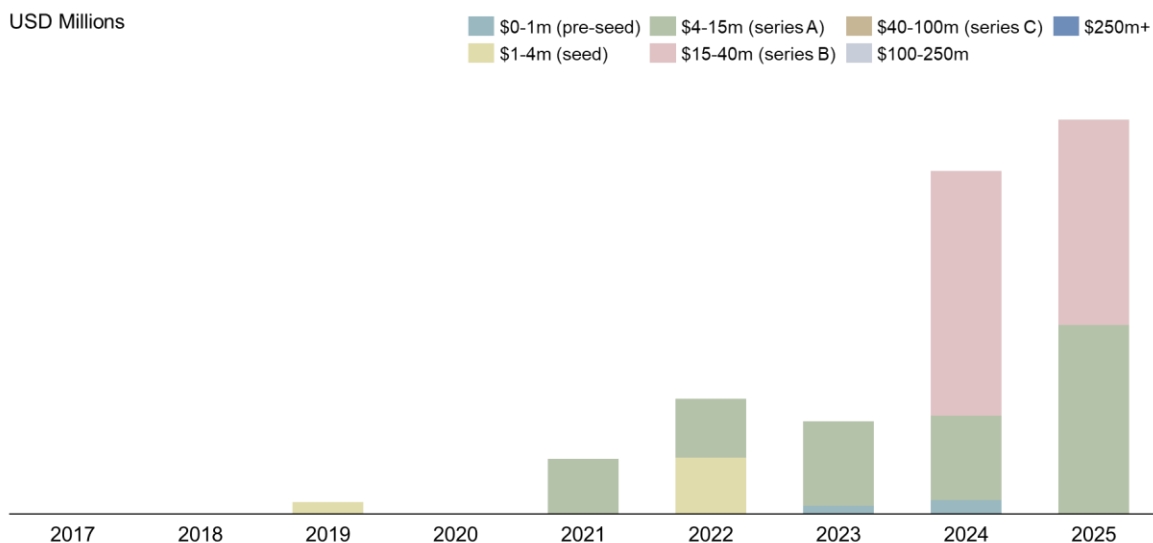
Figure 4: Market map of companies offering PFAS-free alternatives



In 2022, a coalition of 47 asset managers—led by Aviva Investors and Storebrand Asset Management—called on chemical company CEOs to phase out PFAS, backing their appeal with \$8 trillion in managed assets, signaling a growing institutional awareness and drive to start moving towards safer alternatives.

For investors, the PFAS-free innovation space offers a dual return profile: financial upside through early entry into a high-growth market, and social impact through support of public health and environmental sustainability. Targeted investments in advanced materials, clean chemistry, and scalable technologies will be critical to accelerating the transition and unlocking long-term value.

Figure 5: Funding rounds for PFAS alternatives



4.1 PFAS investment strategy

Within consumer-facing segments, there are two distinct pathways for investors: near-term returns through early-stage ventures and longer-term value creation via strategic R&D and incumbent engagement. The short-term opportunity lies in backing startups operating in regulated markets with rising consumer demand for PFAS-free alternatives, particularly in textiles and paper/packaging. These sectors offer lower technical barriers to substitutions and are already seeing traction.

Key investment mechanisms include:

1. Funding R&D and philanthropic initiatives at research institutions focused on bench-scale development of PFAS-free coatings and materials.
2. Scaling early-stage ventures to attract strategic partnerships or acquisition interest from incumbents seeking to integrate safer chemistry into their supply chains.

Capital deployed into R&D not only accelerates innovation but also expands the solution set available to industry, thus positioning investors to capture upside from both market growth and regulatory alignment.

In parallel, established players are increasingly active in transitioning away from PFAS. Driven by regulatory mandates and consumer expectations, incumbents are investing in internal R&D and forming partnerships with startups to reengineer their chemistry and manufacturing processes. Strategic investment in these startups can serve as a bridge to acquisition or licensing opportunities, enabling investors to participate in the broader industrial transformation.

4.2 PFAS investment strategy: Textile industry case study

In the textile industry, many of the leading incumbents have already made inroads to “fix” their apparel to exclude PFAS. For example, H&M banned PFAS in their apparel, homeware, and shoes in 2013, and in branded cosmetics in 2018. Burberry has banned

long-and short-chain PFCs in all products. Levi Strauss & Co. has banned the use of PFCs in all products and extended that ban to include all related PFAS.

Startups are playing a critical role in enabling this transition. For example: Green Theme Technologies partners with textile mills like Haartz Corporation, YKK, and Hwasung, which in turn supply textile brands such as Nike, Black Diamond Equipment, Lululemon, and others to use their Empel PFAS-free and waterless finishing technology for apparel. HeiQ Materials has established partnerships with MAS Holdings, Puma, Patagonia, HUGO BOSS, etc. OrganoClick partners with multiple textile brands in Europe, such as REV'IT! Sport International, Klättermusen, Snickers Workwear, Bever, Reima, etc. for its waterproofing and garment care products.

Investor interest is growing. Pangaea Ventures' investment in Green Theme Technologies was driven by the startup's technical differentiation, regulatory readiness, and validation through industry partnerships. The firm cited strong scaling potential, particularly in regions with expanding textile markets and heightened environmental scrutiny.²⁶

A similar investment thesis applies to the paper and packaging sector, where substitution is technically feasible, and consumer-facing brands are under pressure to reformulate.

4.3 PFAS investments strategy: Electronics industry case study

In contrast, the electronics and semiconductor sectors present a longer-term investment horizon. Regulatory pressure is limited, but litigation and reputational risks are rising. For instance, Apple faced a class-action lawsuit in early 2025 over PFAS content in watch bands.

Despite limited commercial alternatives, the sector represents the largest consumer market for PFAS. Investors seeking exposure must adopt a patient capital approach by supporting R&D pipelines and academic-industry collaborations that could yield viable substitutes over time. This strategy positions investors to benefit from future regulatory shifts and growing environmental and social scrutiny.

4.4 PFAS investments into water mitigation

Unlike consumer market alternatives, investments in PFAS water mitigation are primarily driven by regulatory mandates. The scale of environmental damage and the associated remediation costs far exceed current public-sector capacity, creating significant opening for private capital. Recent estimates place the global cost of PFAS-related damage to water systems at over \$400 billion, underscoring the magnitude of the challenge and the urgency for scalable solutions.¹

Legal liabilities are also mounting. More than 6,400 lawsuits have been filed globally, resulting in over \$15 billion in damages paid by major chemical manufacturers. This litigation landscape signals rising financial exposure for polluters and increasing demand for effective mitigation technologies.

However, as much as state and federal legislation might incentivize new mitigation technology, current government funding is enough to bring technologies into widespread use. Many technologies available in the market today are too expensive, and others are not yet fully scalable.

The EPA utilizes the work breakdown structure (WBS) to derive system-level costs and provides comprehensive, flexible, and transparent tools to help estimate treatment costs on a standard facility basis. Within the EPA model, granulated activated carbon (GAC) has the highest removal rate at the lowest total capital costs, compared to other mitigation technology available.²⁷

Investment funds have backed a range of water mitigation technologies, including GAC, advanced oxidation processes, plasma destruction, and diagnostic kits for testing PFAS in wastewater, drinking water, soil, and biosolids. Early adopters of these technologies include federal agencies, industrial manufacturers, and municipal water utilities, customers typically characterized by longer sales cycles.

Figure 6 PFAS water mitigation technology readiness levels

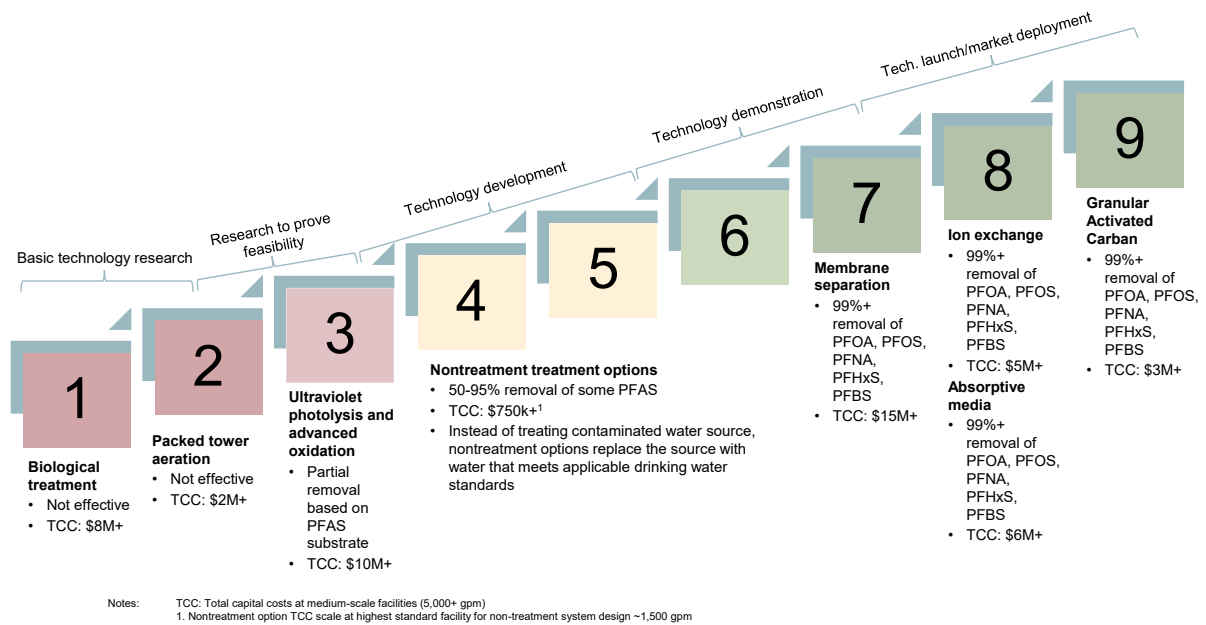
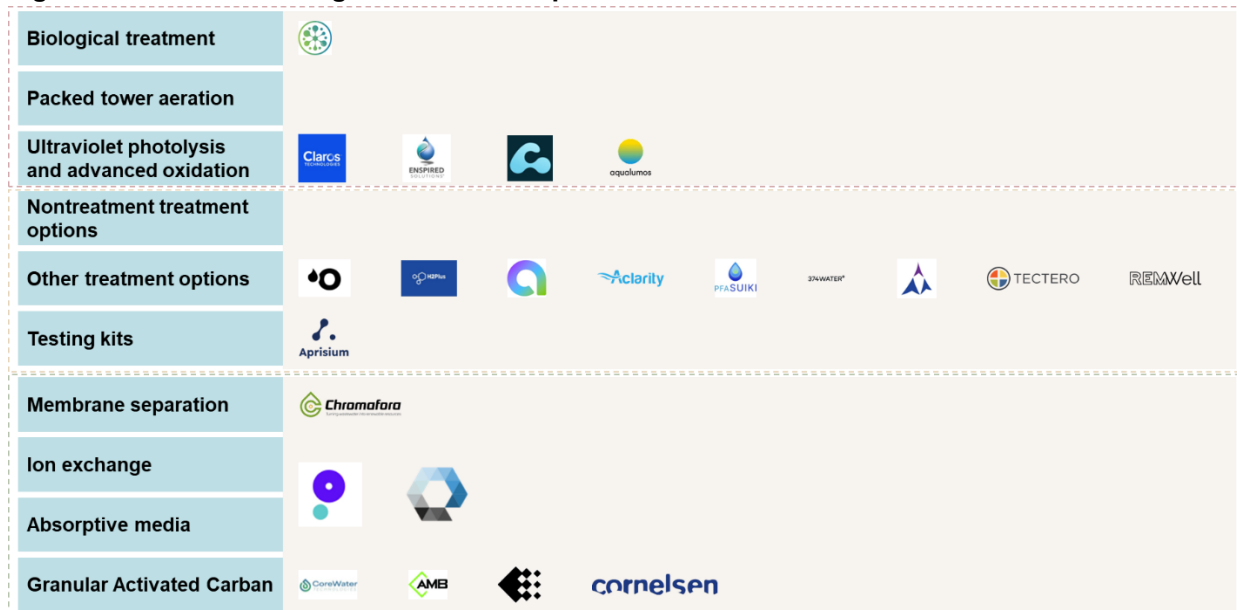
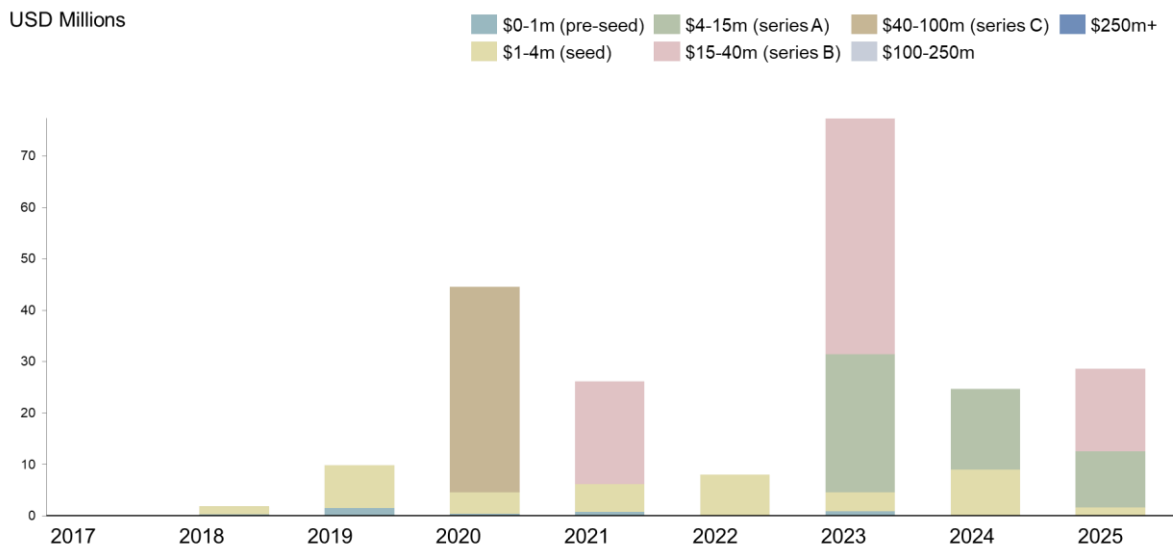


Figure 7: PFAS water mitigation market map



To date, PFAS destruction-focused startups have raised over \$200 million in private funding, with Series B rounds attracting the largest share, followed by Series A and seed-stage investments. Venture capital remains the dominant funding source. ²²

Figure 8: Funding rounds for PFAS water treatment



For investors, the PFAS remediation market for water treatment presents an opportunity to fund scalable technologies that address critical environmental challenges. With public funding constrained and regulatory pressure mounting, private capital can play a transformative role in accelerating innovation, expanding deployment, and unlocking returns in a market poised for rapid growth.

5 Conclusion

As global awareness of PFAS-related health and environmental risks intensifies, the urgency to accelerate the development and deployment of PFAS-free solutions is becoming a defining challenge and opportunity for investors. With nearly 99% of Americans carrying detectable levels of PFAS in their bloodstream, and mounting evidence linking these compounds to cancer, endocrine disruption, and immune system impairment, the market is positioned for transformation.

Regulatory frameworks are evolving but remain fragmented. The European Union has taken a leadership role with broad bans and sector-specific substitution mandates, while the United States continues to rely on a patchwork of state-level regulations. This regulatory lag creates a strategic window for investors to shape the market transition through targeted capital deployment.

Across sectors, the PFAS-free innovation ecosystem is still growing and undercapitalized. Startups in textiles, paper and packaging, and water mitigation are developing promising technologies, but face barriers to scale. Meanwhile, incumbents are increasingly investing in internal R&D and forming partnerships to reengineer their supply chains.

For investors, the opportunity spans multiple segments:

1. Consumer-facing sectors such as textiles and paper and packaging offer near-term returns through venture investments in startups with validated technologies and strong brand partnerships.
2. Electronics and semiconductors, while harder to substitute, represent a long-term growth opportunity through R&D support and strategic engagement with industry leaders.
3. Water mitigation technologies are driven by regulation and litigation, making them an opportunity for infrastructure and project-based investment models.

Ongoing research into the health and environmental risks associated with PFAS is accelerating regulatory and consumer pressure for viable substitutes. While some markets have yet to present a scalable alternative, the moment a solution emerges, it is poised to attract rapid and substantial capital deployment, driven both by urgency and opportunity.

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