Environmental Science & Technology
pubs.acs.org/est
Viewpoint

The True Cost of PFAS and the Benefits of Acting Now

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Cite This: https://doi.org/10.1021/acs.est.1c03565
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KEYWORDS: *PFAS, social costs, chemicals policy, remediation, prevention*

INTRODUCTION

Per- and polyfluoroalkyl substances (PFAS) are a class of over 9000 persistent hazardous chemicals used in industrial processes and consumer goods. They are ubiquitous in the environment and in people, who are exposed to PFAS via contaminated food and water, consumer products, and workplaces.[1] Exposure to several PFAS has been linked to a plethora of health effects in both animal and human studies, even at background levels. They are so environmentally persistent that they have been termed "forever chemicals."

While in many ways PFAS contamination problems reflect broader issues with the chemicals regulatory system in the United States, a key feature of this industry is that only a handful of companies have produced the basic chemical building blocks for PFAS chemicals. These companies have known about the potential toxicity, human exposure, and extreme persistence of PFAS since the 1970s, yet have continued and expanded production.[2]

In the 2000s, in response to mounting pressure from the U.S. Environmental Protection Agency (EPA) about risks to human and environmental health, PFAS manufacturers agreed to phase out U.S. production of perfluorooctanoic acid (PFOA), perfluorooctanesulfonate (PFOS), and some related PFAS. Replacement PFAS, including new chemicals developed by industry, are widely used in more than 200 use categories,[3] despite growing concerns about exposures, persistence, and toxicity.[4]

The PFAS industry claims that the chemicals' use in consumer goods and industrial applications brings wide benefits, valuing the U.S. fluoropolymer segment at $2 billion a year.[5] However, it fails to mention the costs of exposure, which are long-term, wide-ranging, routinely externalized onto

Received: June 1, 2021

the public, and disproportionately experienced. Focusing on a narrow, short-term view of PFAS benefits ignores how costs are displaced to communities and governments, despite existence of safer alternatives in most product sectors.

This review of the true costs of PFAS highlights the need to act now to ensure that exposures are capped at current levels by reducing the production and use of PFAS. It calls attention to systematic failures of U.S. chemical regulation, including inadequate premarket review of new compounds, data gaps that prevent and delay the regulation of existing chemicals, and the widespread externalization of social costs of pollution onto the public.

■ SNAPSHOT OF THE PROBLEM

Shifting the Burden to Public Utilities. Widespread contamination of surface water and groundwater due to industrial releases of PFAS or use of PFAS-containing firefighting foams is now a major problem in the United States and globally. An estimated 200 million U.S. residents, nearly two-thirds of the U.S. population, receive municipally provided drinking water that is contaminated with PFAS.[6]

Methods to reduce levels of PFAS in drinking water include filtration with granular activated charcoal treatment, reverse osmosis, ion exchange, or blending with less contaminated water from other sources, none of which fully eliminate PFAS. Municipalities may also opt to buy water from other distributors, but each method involves significant capital costs for new infrastructure and ongoing maintenance costs. For example, following extensive contamination by a PFAS manufacturer in the Cape Fear River watershed, Brunswick County, North Carolina spent $99 million on a reverse osmosis plant and will incur $2.9 million annually in operations expenses. Orange County, California estimates that the infrastructure needed to lower the levels of PFAS in its drinking water to the state's recommended levels will cost at least $1 billion.

These costs of cleaning up PFAS contamination of water are rarely internalized by chemical manufacturers or other responsible parties. Instead, they are usually displaced onto public utilities, their ratepayers, and state and local governments.

Communities with PFAS-contaminated drinking water also incur expenses related to testing and monitoring the contamination, informing the public, gathering information on treatment alternatives, studying the feasibility of infrastructure investments, and staff time for these projects. Low-income communities may be unable to cover such expenditures and often have few options for cost recovery, especially when the source of the PFAS contamination has not been determined. Additionally, PFAS contamination is likely to disproportionately impact vulnerable communities due to historic racial discrimination in housing and occupational sectors, and inequitable enforcement of environmental regulations that concentrate point sources of pollution proximal to these communities.

PFAS in wastewater can lead to additional expenses for public utilities. Wastewater treatment plants are designed to remove solids and pathogens, not persistent chemicals, and so any PFAS coming into the treatment plant are largely discharged into receiving waters or left as contaminants in sewage sludge. Needed treatment to remove contaminants will result in increased costs, and failure to treat may decrease existing revenue streams. For example, the public utility managing Merrimack, New Hampshire's wastewater currently earns $400,000 annually from processing sludge into compost for public sale as fertilizer. If the utility can no longer sell the sludge due to PFAS contamination, it will instead have to spend $2.4 million annually in landfill charges.

Other Externalized Costs of PFAS. Many other PFAS-related costs are routinely passed on to the public, rather than paid by the responsible polluters. For example, to prevent further contamination of water resources, the stock of fluorinated aqueous film-forming foams (AFFFs) still in place at military bases, airports, industrial sites, and local fire stations needs to be replaced with nonfluorinated foams. This requires collecting the AFFFs and then decontaminating or replacing equipment. The unused AFFFs and the PFAS-laden rinsewater must be contained, and no safe, permanent destruction methods currently exist.

The process of deciding what to do with hot spots of PFAS contamination is labor-intensive, time-consuming, and expensive. Testing of soil and water to determine the extent of contamination typically costs hundreds of dollars per sample, and few cleanup options exist. Landfilling of contaminated soil involves transportation costs and tip fees, and PFAS are only sequestered for the lifespan of the landfill. Incineration may destroy PFAS but only at extremely high temperatures, and has not been shown to work at large scale. Concerns about emissions from PFAS incineration, as well as public outrage at incineration testing in impacted communities, point to both health and political costs of PFAS incineration.

PFAS contamination may also reduce property values of homes and businesses. The discovery of water contamination, or even the perceived risk of potential contamination, can depress property values and stigmatize neighborhoods, potentially leading to lower home values and blocking residents' from selling properties, particularly when contamination achieves a level of public notoriety.[7]

Households and local businesses seeking to avoid exposure to contaminated drinking water may have to purchase bottled water or install and maintain home water filtration systems. In cases where the polluter is known, these costs may be recoverable through costly litigation. More often, however, the precise source of PFAS contamination is unclear, contested, or involves multiple polluters, making litigation or regulatory outcomes uncertain. Additionally, residents living outside of established boundaries or whose water is below specific action levels may not qualify for alternative water supplies, even if distribution systems exist.

Farms in areas with PFAS-contaminated water or soil may be forced to destroy harvests or products, or even to cease operation. As examples, dairy farms in more than one state were forced to dump milk contaminated with PFAS from agricultural applications of sludge and to euthanize their herds, while an organic farm near Colorado's Fort Peterson Air Force Base completely ceased production after learning that their irrigation water was highly contaminated.

Again, the governance and research expenses in such instances are substantial. In addition to technical expertise and staffing related to exposure assessment, human biomonitoring, and cleanup efforts, local and state governments must invest significant resources in public engagement and communications, and in managing PFAS programs and task forces. For example, North Carolina has allocated over $5 million for its PFAS Testing Network to address ongoing questions about PFAS exposure.

https://doi.org/10.1021/acs.est.1c03565
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State and local governments may also incur significant legal expenses. States including New Hampshire and New Jersey have been sued by PFAS manufacturers opposed to health-protective drinking water regulations. States have occasionally received compensation from the companies responsible for PFAS pollution in their environs, including Minnesota ($850 million), Alabama ($39 million), and Michigan ($168 million).[8] The number of lawsuits and the size of settlements indicates the nation-wide scope of PFAS contamination and the costs of exposure. Legal actions such as these require significant time and resources from state-employed and contracted lawyers, consultants, and other professionals.

Moreover, these legal actions happen after the damage has occurred. Since complete remediation of PFAS in the environment is impossible at this time, exposures will remain for generations to come.

Health Impacts: The Biggest Externality. Exposure to PFAS via contaminated drinking water has been linked to kidney and testicular cancer, ulcerative colitis, pregnancy and fertility problems, liver diseases, thyroid disease, and high cholesterol.[1,9] PFAS exposure is also linked to immunotoxic effects, including decreased response to vaccines and possible increases in COVID-19 severity.[10] Even low-level exposure is associated with serious health consequences. For example, multiple studies have linked prenatal PFAS exposure with low birth weight, a particularly concerning end point that is associated with higher risk of cardiovascular disease, respiratory disease, and diabetes in adulthood, as well as impaired cognitive development and lower lifetime earnings.[11]

The impacts on human health due to PFAS exposure are immense. A recent analysis of impacts from PFAS exposure in Europe identified annual direct healthcare expenditures at €52−84 billion.[12] Equivalent health-related costs for the United States, accounting for population size and exchange rate differences, would be $37−59 billion annually. These costs are not paid by the polluter; they are borne by ordinary people, health care providers, and taxpayers.

Indirect social costs are also extensive, though more difficult to calculate. They include lost wages; lost years of life; reduced quality of life; increased stress, anxiety, and depression; and subsequent impacts on families and communities. Such social costs are quantifiable and can guide policy,[13] but no such analysis currently exists for health impacts from PFAS in the United States.

Finally, other significant health-related costs borne by government institutions and taxpayers include biomonitoring and health monitoring of exposed populations, and government research expenditures aimed at identifying PFAS toxicity and extent of exposures. In a more equitable world, this research would be carried out by the producer before the chemical came onto the market.

DISCUSSION

The health, societal, and economic impacts of contamination from PFAS production and use are multifaceted and broadly distributed. The costs of these impacts are long-term, incompletely understood, and externalized onto individuals, communities, and government at all levels, while profits accrue to corporations shielded from these costs by the protections built into our chemical regulatory laws and practices.[14] The continued use of PFAS will lead to increases in contamination and exposures in the future. But these exposures can be capped if steps are taken now to reduce and eventually phase out production and use of PFAS in all nonessential applications. In the meantime, the responsibility for paying for the legacy contamination should rest on the companies who continue to produce and market these chemicals even though they know about the chemicals' toxicity and extreme persistence.

Under a precautionary system of chemicals production in which companies had to demonstrate the safety of their products before accessing markets, costs could be substantially reduced by avoiding the production of toxic substances, and remaining costs would be internalized by PFAS producers into the price of their products. But in the United States, these costs are largely borne by the public and public institutions.

As this review of PFAS externalities shows, meaningful action must address not just remediation and cleanup of legacy contamination, but must also reduce current production and uses of PFAS, in order to limit the extent of future exposures. Class-based regulation of all PFAS is needed,[15] and California's recent action to regulate PFAS as a class in consumer products demonstrates that class-based restrictions are possible and desirable.[16]

Ubiquitous exposure to many toxic chemicals, not just PFAS, reflects a failure of regulatory systems to adequately reduce risk, and a privileging of short-term industry profits over long-term public health and environmental impacts. While the costs of drinking water treatment and PFAS remediation are substantial, the potential health-related costs of continued exposure to PFAS are much larger and will likely impact vulnerable communities disproportionately. Failing to take timely action to reduce the production and use of PFAS will result in exponentially higher costs to be paid by exposed populations for generations to come.

Understanding the true extent of these costs will clarify the benefits of improved regulatory controls and timely clean-ups. It will enable residents and policy makers to make informed decisions about who should rightfully bear responsibility for impacts and compensation. A strengthened regulatory system is needed, both in terms of enforcement of existing regulations and enactment of stronger, class-based laws to internalize the costs and reduce or eliminate the production of persistent, mobile, bioaccumulative, and toxic compounds. Only a strengthened regulatory system can adequately protect public health and the environment, and end the practice of forcing the public and future generations to bear the financial and health burden of pollution.

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https://doi.org/10.1021/acs.est.1c03565
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Notes

The authors declare no competing financial interest.

■ ACKNOWLEDGMENTS

We are grateful to Dr. Andrew Lindstrom for invaluable comments and suggestions. We acknowledge funding from the National Science Foundation (SES-1456897; AC, PB, and DHS), the National Institute of Environmental Health Sciences (P30ES000260; LT); and the Tides Foundation (TF2101−096968; GG, SP, and DHS).

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