



The Nelson A. Rockefeller Center
at Dartmouth College

*The Center for Public Policy
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The Class of 1964 **Policy Research Shop**

Chemicals of Concern: Assessing the Effects of Vermont S. 25 on Health, Environment, and Economy

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This report was written by undergraduate students at Dartmouth College under the direction of professors in the Rockefeller Center. Policy Research Shop (PRS) students produce non-partisan policy analyses and present their findings in a non-advocacy manner. The PRS is fully endowed by the Dartmouth Class of 1964 through a class gift in celebration of its 50th Anniversary given to the Center. This endowment ensures that the Policy Research Shop will continue to produce high-quality, non-partisan policy research for policymakers in New Hampshire and Vermont.





Introduction

- Growing research on:
 - Harmful health and environmental effects of modern chemicals
 - Presence in drinking water, consumer products, environments
 - Increasing scrutiny on manufacturers
- Many chemicals are bioaccumulative and widespread
 - Contribute to cancers, decrease vaccine response, affect fetal and child development, and more
- Recent efforts to trace and regulate these chemicals
 - EPA, Biden-Harris Administration, states (VT, NY, WA, RI, MI, etc.)
 - Bills prohibit/monitor manufacture, sale, distribution, effects, presence of harmful chemicals



Vermont S. 25 Overview

- Seeks to mitigate environmental contamination by:
 - Prohibiting 14 chemical families of concern in popular consumer goods like cosmetics, menstrual products, ski wax, textiles, and athletic turf products
 - Ban on chemicals in cosmetic and menstrual products and PFAS in ski wax/textiles: Jan. 1, 2025
 - Ban on products with intentionally-added PFAS: Jan. 1, 2027
- Community Engagement Plan:
 - Identify cosmetic products marketed to BIPOC individuals
 - Provide culturally appropriate education
 - Suggest priority chemicals to regulate
- Violation of this bill is a violation of the Consumer Protection Act



Problem Statement

If passed, S. 25 would play a significant part in the effort to curb environmental and public health harms from the chemicals of concern in Vermont. However, regulating harmful chemicals comes at a cost. Namely, these chemicals are integral to many consumer-packaged products, and their restriction could create challenges for affected businesses, industries, and consumers alike. This report seeks to understand these complex trade-offs as they may emerge from the passage of S. 25.



Methodology

- **Existing literature analysis**
- **Case studies: Analysis of existing bills in other jurisdictions**
- **Case studies: PFAS alternatives in industry**
 - Comprehensive examination of chemical-of-concern-free alternatives across impacted product fields conducted to assess economic viability and quality implications
- **Expert interviews**
 - Dr. Celia Chen, aquatic ecologist at the Geisel School of Medicine
 - Dr. Megan Romano, epidemiologist at the Geisel School of Medicine
 - Chelsea Murtha, Senior Director of Sustainability for the AAFA



Background

- **Federal policy landscape**
 - EPA:
 - April 2021: establishes EPA Council on PFAS to develop strategy
 - October 2021: announces “PFAS Strategic Roadmap” with three goals: Research, Restrict, Remediate
 - Biden-Harris administration actions:
 - January 2022: EPA plans to designate PFOA and PFOS as hazardous substances
 - October 2023: EPA improves PFAS reporting to Toxic Release Inventory
 - March 2023: EPA proposes National Primary Drinking Water Regulations for six PFAS in drinking water
 - EPA actions limited, states have opportunity to create own regulations to fill gaps



Background

- **Vermont policy landscape**
 - S. 20
 - Targets PFAS, bisphenols, and ortho-phthalates in specific products
 - S. 20 passed Senate and House unanimously before Governor Scott signed it into law
 - As of January 1st, 2024, all provisions have been enacted, though outcomes are yet to be analyzed
 - S. 25
 - Builds upon S. 20 framework
 - In April 2023, S. 25 achieved unanimous passage in the Senate



Background

- **Chemicals of concern**
 - S. 25 targets 14 chemical families of concern (nearly 20,000 individual compounds)
 - PFAS includes over 15,000 unique molecules
 - Categorized into those that are especially persistent (“forever chemicals”) and those that cause more acute harm
 - Only PFAS considered “forever chemicals” for our analysis
 - PFAS will be addressed separately from the other 13 chemical families of concern in this report



Investigation of Similar Bills

- **Maine**

- Maine's H.P. 1113, "An Act to Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution"
- Passed in April 2021 and amended in June 2023 with H.P. 138
 - Grants manufacturers of PFAS-containing products until January 1, 2025 to submit notifications detailing product usage and PFAS content.
 - A complete ban effective by January 1, 2030, except for specific circumstances.
- "PFAS source reduction program" aimed at reducing PFAS discharges, promoting safer alternatives, educating the public and corporations, and providing grants for treatment works.



Investigation of Similar Bills

- **Rhode Island**

- Rhode Island's H.B. 5673, “Comprehensive PFAS Ban Act of 2023”
 - Proposes a complete ban on all uses of PFAS, except when unavoidable, by Dec. 31, 2032
- Manufacturing and sale of outdoor apparel for wet conditions containing PFAS will also be banned, unless labeled as “made with PFAS chemicals”
 - Goal to phase out such products by Jan. 1, 2028
- Requires manufacturers of PFAS-containing products sold in RI to register products on a public database by Jan. 1, 2026



Investigation of Similar Bills

- **New York**

- New York's State Assembly bill A6969, the "Safe Personal Care and Cosmetics Act," proposes a ban on personal care and cosmetics products containing restricted substances
 - Prohibits substances as functional ingredients, as well as nonfunctional byproducts or contaminants above the "practical quantification limit"
- Manufacturers have a two-year phase-out period before the ban takes effect
- The list of restricted substances parallels those in Bill S. 25



Investigation of Similar Bills

- **Washington State**

- Washington House Bill 1047, “Concerning the use of toxic chemicals in cosmetic products,” passed on May 15, 2023, and went into effect on Jul. 23
 - Prohibits manufacturing, distribution, or sale of cosmetics containing specified substances
- A sell-through provision allows retailers until January 1, 2026 to exhaust existing stock
- By June 1, 2024, the Departments of Ecology and Health must assess hazards of similar chemicals in cosmetics and make the information public.
 - Must also implement initiatives to support small cosmetic manufacturers and cosmetology businesses in transitioning to safer products by May 2024.



Investigation of Similar Bills

- **The European Union**

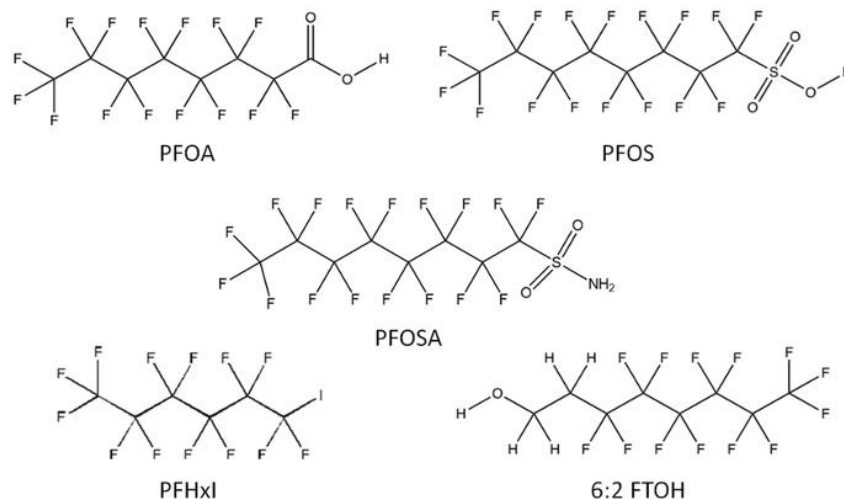
- The European Chemical Agency (ECHA) proposed a restriction on approximately 10,000 PFAS chemicals on February 7, 2023.
- Currently facing challenges in implementation.
- The strategy aims to ensure consumer products exclude chemicals causing cancers, mutations, reproductive or endocrine disruptions, or persistence and bioaccumulation, unless their use is unavoidable.
- The EU's plan may have been abandoned



Chemicals of Concern - Properties

● PFAS: Physical Properties

- Per- and polyfluoroalkyl substances (PFAS)
 - Synthetic
 - Strong carbon-fluorine bonds
 - Resistant to degradation
- PFAS are both non-polar and water-soluble
- PFAS can be classified into short-chain and long-chain group

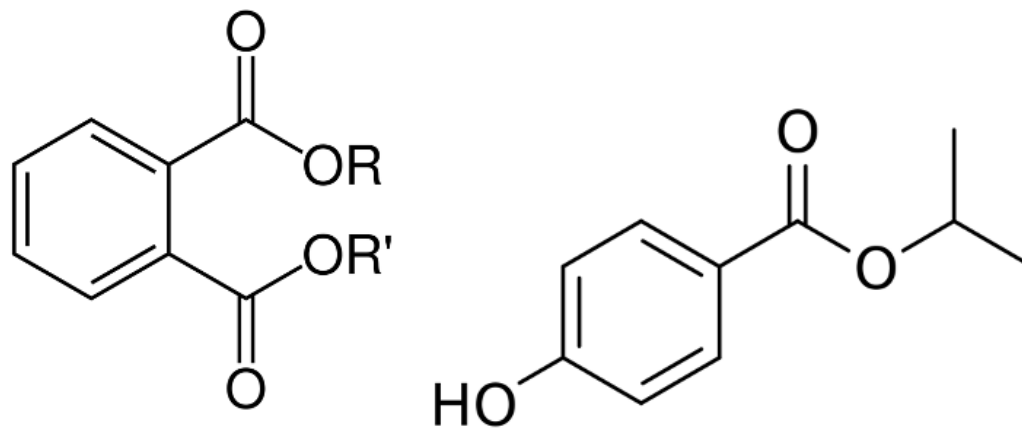


Structures of Five PFAS



Chemicals of Concern - Properties

- **Non-PFAS Chemicals of Concern: Physical Properties**
 - Vary dramatically



Base Structure of an Ortho-phthalate (left) and Full Structure of Isopropylparaben (right)



Environmental Health

- **PFAS: Impact**

- Extensively used by many industries
- Migrate into soil, water, and air during production and use
 - Accumulate in animals through food chains
- Found globally, from the Himalayas to the North and South Poles
- Highly degradation-resistant
- Rapidly transferable in the atmosphere, moving swiftly through the environment
 - Also highly mobile in non-atmospheric conditions, permeating soil and groundwater upon release into a particular environment



Environmental Health

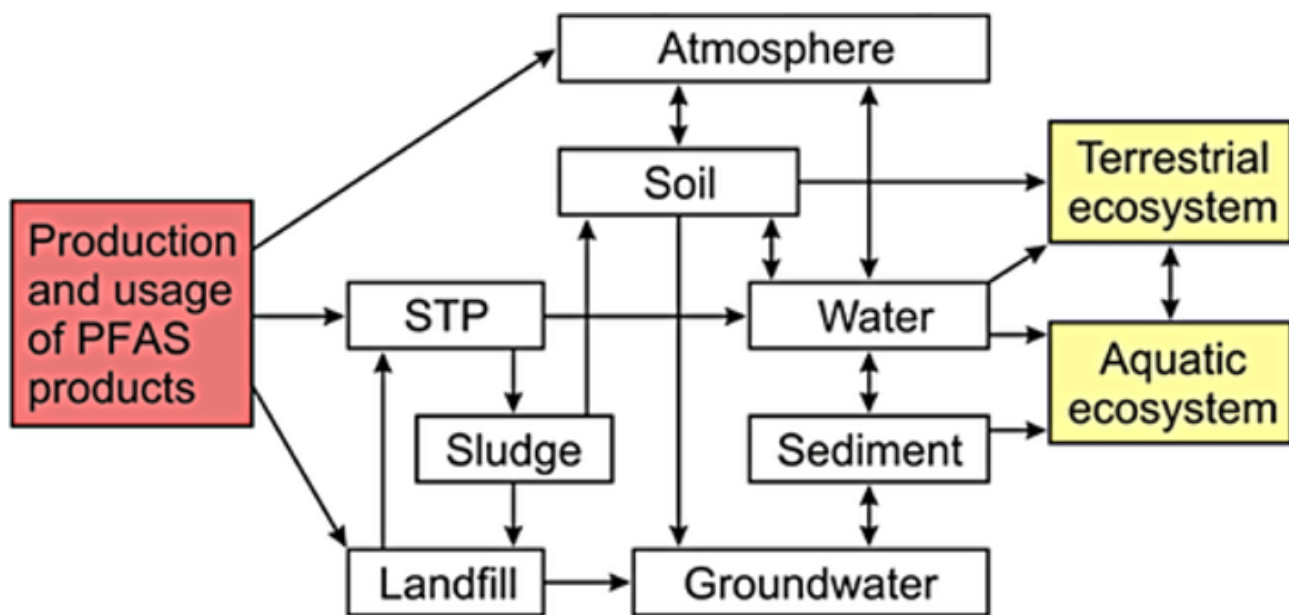
- **PFAS: Impact Cont.**

- Presence in aquatic ecosystems raises concerns due to pathway for human exposure
 - Detection of PFASs, PFCAs, PFA_xA, PFOSA, and PFPAs in samples globally has raised health concerns
- Traditional sewage treatment plants are ineffective in removing PFAS from water
 - Expensive processes required
- In terrestrial ecosystems, release by plants and permeation into soil and groundwater are concerns
 - Deterioration of soil quality
 - Limited techniques for permanent elimination
 - Uptake by plants → food chain and humans



Environmental Health

- **PFAS: Impact Cont.**



Pathways of PFAS in the Environment



Environmental Health

- **Non-PFAS: Impact**
 - Chemicals used across industries:
 - Commonly plastics, preservation, and solvent stabilization
 - Examples:
 - Mercury compounds
 - Circulate in the atmosphere
 - Impact aquatic ecosystems
 - Triclosan
 - Enters waterways via drains
 - Poses chronic health risks
 - Contributes to multidrug resistance in bacteria



Environmental Health

- **S. 25 Effectiveness**

- Seeks to mitigate environmental contamination by chemicals of concern
- Addresses the production and circulation of products, but overlooks their disposal
 - May lead to further environmental contamination
 - Without comprehensive disposal plan:
 - Chemicals could leach into waterways and the environment
 - May exacerbate environmental harm
 - Crucial to concurrently develop strategies for the safe disposal of products containing these chemicals



Human Health

- **PFAS: Impact**

- Exposure routes are numerous
 - Widely used in households for resistant properties
- Most individuals likely harbor PFAS
 - Over three percent of the US population surpasses proposed safety limits
- Scientific studies link exposure to cancers, immune deficiencies, and metabolic disorders
 - High exposure scenarios associated with higher cancer risks



Human Health

- **PFAS: Impact Cont.**

- Immunotoxicity is evident across various animal models
 - Studies show molecular and organ-level impacts
- Children show particular vulnerability to PFAS-induced immune function deficits
 - Associated with reduced antibody concentrations for many vaccines
- Elevated PFAS levels correlate with:
 - Adverse lipid profiles, impacts on glucose, insulin, diabetes
- Risk of PFAS-related health effects varies based on exposure factors, individual sensitivity, and access to healthcare and safe water



Human Health

- **Non-PFAS: Impact**

- 13 other chemical families of concern exhibit various impacts:
 - Endocrine system, hormones, child growth and development, cancer, organ damage
- For example:
 - Mercury (methylmercury) is a potent neurotoxin affecting distal nerves, speech, vision, and fetal/neonatal development
 - Triclosan acts as an endocrine disruptor, potentially leading to tumor development
 - Exposure during pregnancy results in many complications



Human Health

- **Bill S. 25 Effectiveness**
 - Targets common household products and items in close contact with individuals.
 - Contributes to efforts in decreasing exposure to harmful chemicals
 - Aligns with legislation regulating drinking water (Act 21, S. 49)
 - Mandates monitoring of PFAS levels in public water systems
 - Both address primary sources of PFAS exposure
 - Enhance public health protection efforts in Vermont



Market Impact (Businesses, Industries, Consumers)

- **Chemicals of Concern Role for Businesses and Industries:**
 - Utilized in various consumer products and manufacturing processes since around the 1940s
- **Supply-Side Impact of S. 25: Businesses and Industries**
 - Business concerns about challenges with transitioning to alternative chemicals (cost barrier, structural changes)
 - Ex: backlash from businesses in response to EU legislation
 - Emphasis on “sell-through” provision to avoid “stranded inventory”
 - NY and WA have included this
 - MI, RI, and VT have not as of now



Market Impact (Businesses, Industries, Consumers)

- **Supply-Side Impact of S. 25: Businesses and Industries (Cont.)**
 - Options for alternatives → functionally and financially competitive
 - Ski wax: Swix, Toko, and mountainFLOW offer PFAS-free products
 - Outdoor apparel: PFAS/PFC-free membrane made of ePE
 - Cosmetics: Ulta Beauty's "Clean Ingredients" List
 - Athletic turf: products exist that are free of PFAS and other harmful chemicals (lead, phthalates, and BPA)
- **Demand-Side Impact of S. 25: Consumers**
 - Increased production costs → increased prices for consumers
 - Disproportionate impact on marginalized communities



Protecting Vulnerable Populations

- **Disproportionate Impacts**

- Sources of pollution/chemical hazards more likely to be located near vulnerable groups
 - Men of color and low SES have higher rates of injury and death from air pollution
- Indigenous populations at elevated risk for chemical pollutant exposure → much of US resource extraction takes place on tribal lands
 - Populations have levels of chemical pollutants ten-times higher than those living in urban areas
- 21% of all people of color and 19% of all houses with incomes below the federal poverty line
 - Located within 3 miles of a Superfund site
- More low-income households and people of color live within five miles of a PFAS-contaminated site than expected based on census data



Protecting Communities of Color & Marginalized Populations

- **Case Study: Challenges in Navigating Legislative Process**

- Demographics:

- Willowbrook: Affluent town

- Lake County: Majority low-income area with high Hispanic population

- Situation:

- Both equally affected by the atmospheric contamination of a carcinogenic chemical from a nearby production facility

- Reaction:

- Willowbrook: EPA directly involved in campaigning on behalf of the residents → 90% drop in chemical concentrations

- Lake County: received no EPA attention and had to form their own coalition in an attempt to advocate for their community's health



Conclusion

- **Methods:** Case study of existing regulations, analysis of current research, interviews with experts and authorities
- **Goal:** distill takeaways for Vermont House as it contemplates S. 25
- **Findings:**
 - **Environment**
 - Chemicals of concern: harm terrestrial and aquatic environments
 - S. 25: would potentially minimize harms by minimizing further circulation of PFAS
 - **Human Health**
 - Chemicals of concern: several negative health outcomes for various populations
 - S. 25: could address these concerns by banning chemicals from products that come in direct or close contact with people's bodies
 - **Market**
 - Supply-side: chemicals play big role for businesses/industries, alternatives exist
 - Demand-side: "clean products" are competitive but must protect marginalized communities



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Thank you for your time

The completed brief can be found here:

<https://rockefeller.dartmouth.edu/public-policy/class-1964-policy-research-shop/prs-briefs>