PFAS Pre-Workshop Input Tool Responses

This document is a repository of all submissions received through the EHMI input tool for the upcoming workshop, *Identifying Opportunities to Understand, Control, and Prevent Exposure to PFAS: A Workshop of the Environmental Health Matters Initiative.* The responses are broken down into three large categories: Exposure, Treatment, and Prevention. These are further subdivided into actions, barriers, and actors for each. Respondents were asked to classify their answer based on the table below. Some of the responses listed are translated from alphanumerical code, a table for which can be found below.

Action Codes:

A. Scientific, Engineering, or Health Advances or Interventions 1. Technology development 2. Healthcare or public health services 3. Research 4. Secondary analyses and technical reports	**B. Individual and Community Change** 1. Behavior change 2. Influence risk perception
C. Governmental Change 1. Regulation 2. Legislation 3. Appropriations and funding 4. Policy change 5. Guidance 6. National and international leadership and cooperation	**D. Advocacy** 1. Public comment 2. Lobbying 3. Public-private partnerships 4. Public-facing campaigns 5. Public engagement (communication) 6. Philanthropic investment 7. Collective action
E. Information Dissemination 1. Scientific publications 2. Digital media (blogs, online magazines, podcasts) 3. Social Media (Twitter, Facebook, Instagram) 4. Media (earned, e.g. press releases or coverage, or paid, e.g. online or broadcast advertising) 5. PSAs 6. Industry list serves and publications	**F. Business and Industry Change** 1. Modifying individual business practices and strategy 2. Making public commitments 3. Increasing transparency and availability of research and other data 4. Developing industry standards 5. Catalyzing and supporting innovation 6. Shaping supply chain activities

Barrier Codes:

A. Resource Constraints 1. Financial capacity 2. Economic conditions 3. Competing priorities 4. Human capital	**B. Policies and Politics** 1. Laws, regulation, and other government policies 2. Political context
C. Market Forces 1. Consumption and production patterns 2. Public perception 3. Corporate behavior 4. Consumer demand	**D. Scientific or Engineering Parameters (that constrain action)** 1. Chemistry 2. Physics 3. Biology 4. Mathematics/engineering 5. Elements of time inherent to the chemical, biological, physical problem at hand
E. Knowledge and Uncertainty 1. Lack of knowledge 2. Scientific uncertainty 3. Misinformation 4. Scientific literacy	**F. Time** 1. Political viability of a policy option at a specific point in time (Overton window) 2. Crisis event demanding immediate action 3. Non-crisis event

Actor Codes:

A. Scientists and Experts 1. NASEM 2. Professional societies 3. Research funders 4. Researchers 5. Clinicians 6. Engineers 7. Scientific advisory boards 8. Think tanks	**B. Government and Intergovernmental Organizations** 1. Public and environmental health practitioners and regulators 2. Legislators 3. Courts 4. WHO, PAHO, etc. 5. US government departments
C. Individuals and Community Organizations 1. Faith groups 2. Civic organizations 3. Individuals 4. Social movements or grassroots organizations	**D. Private Sector** 1. Business 2. Industry 3. Finance
E. NGOs and Philanthropy 1. Public health advocacy organizations 2. Environmental advocacy organizations 3. Other non-governmental organizations 4. Charitable foundations 5. Individual donors	**F. Media and Communications** 1. Broadcast (radio, TV) 2. Print (news, magazines) 3. Online (HuffPost, Medium) 4. Social (Twitter, Facebook)
G. Education and Informal Learning 1. Teachers 2. Administrators 3. Informal learning (museums)	

Exposure

This section includes input from respondents who said "yes" to the question, "Would you like to provide input on actions, barriers, and actors related to exposure to PFAS?"

- Location: Washington, DC
- Sector: Not provided
- Action: Technology development
    - Written reply: Triage and address most-significant risks first: A1, C1-3, D5, E4, F2
- Barriers:
    - Political viability of a policy option at a specific point in time (Overton window)
    - Scientific uncertainty
    - Laws, regulation, and other government policies
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - Courts
    - Scientists and Experts
    - WHO, PAHO, etc.
    - US government departments

- Location: Ottowa, ON
- Sector: Innovation and collaboration using a sustainable blockchain sense 1995
- Action: Technology development
    - Written reply: Stop allowing money and self interest drive the agenda make them accountable up front not once the problem becomes a problem; Educate the community to ask questions by those supplying that has a trail to show who responsible. Blocjchain does that.
- Barriers:
    - Market Forces
    - Scientific or Engineering Parameters (that constrain action)
    - Policies and Politics
    - Resource Constraints
    - Time
- Actors:
    - NGOs and Philanthropy
    - Education and Informal Learning
    - Scientists and Experts
    - Individuals and Community Organizations
    - Government and Intergovernmental Organizations
    - Media and Communications

- Location: West Richland, WA
- Sector: Government
- Action: Technology development, Regulation
    - Written reply: regulation; government
- Barriers:
    - Lack of knowledge
    - Scientific uncertainty
    - Regulation
    - Laws, regulation, government policy
- Actors:
    - Researchers
    - US government departments
    - Public and environmental health practitioners and regulators

- Location: San Francisco, CA
- Sector: NGO
- Action: Technology development, Policy change
    - Written reply: Development of lab methods to detect and quantify PFAS in multiple media; Adopt regulations based on measures of combined PFAS, such as TOP assay or others
- Barriers:
    - Elements of time inherent to the chemical, biological, physical problem at hand
    - Laws, regulation, and other government policies
    - Competing priorities
    - Scientific uncertainty
    - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
    - US Government departments
    - Research funders,
    - Researchers,
    - Legislators,
    - NASEM,
    - Scientific advisory boards

- Location: Columbus, OH
- Sector: NGO
- Action: Technology development
    - Written reply: Technology development for fact-based assessment
- Barriers:
    - Financial capacity
    - Laws, regulation, and other government policies
    - Lack of knowledge

- Actors:
    - Research funders
    - Researchers
    - Public and environmental health practitioners and regulators
    - Business
    - Industry
    - Charitable foundations

- Location: Chapel Hill, NC
- Sector: NGO
- Actions: Technology development, Influence risk perception, Policy change
    - Written reply: Develop methods for destructing perfluorinated contaminants; Improve consumers' mental models of perfluorinated contaminants; Treat discharge points rather than solely focusing on contaminated zones
- Barriers:
    - Engineering challenges
    - Lack of knowledge
    - Competing priorities
    - Misinformation
    - Scientific literacy
    - Economic resources
- Actors:
    - Researchers
    - Research funders
    - Foundations, government agencies, industry
    - Science communication professionals
    - Public understanding of science and misinformation researchers
    - Engineers, policymakers
    - Environmental advocacy organizations, scientific advisory boards, engineers
    - Scientific funders, government agencies

- Location: Rancho Cordova, CA
- Sector: Industry
- Action: Technology development
    - Written reply: Using the ITRC's depiction of the 4 major exposure routes, a GIS model should be built to define high exposure places; The ITRC paper notes observed concentrations of PFAS in various sources (air, soil, sediment, groundwater). These data should be geocoded, mapped, and correlated with exposure places (as suggested in Action 1). The ITRC paper notes studies of PFAS concentrations in humans and fish. These should be geocoded, mapped and correlated to exposure places (per suggested Action 1) and exposure concentrations in the environment (as per suggested Action 2).
- Barriers:

    - Competing priorities
    - Financial capacity
- Actors:
    - NASEM
    - Researchers
    - Think thanks
    - Industry
    - Research funders
    - Environmental advocacy organizations
    - Charitable foundations

- Location: Madison, WI
- Sector: NGO
- Actions: Technology development, Regulation
    - Written reply: low-cost, rapid assessment testing methods for levels of PFAS in environmental media and human/animal sera; Banning vPBvT highly soluble substances from commercial use
- Barriers:
    - Lack of knowledge
    - Financial capacity
    - Corporate behavior
    - Laws, regulation, and other government policies
    - Crisis event demanding immediate action
- Actors:
    - Researchers
    - Research funders
    - Industry
    - Courts
    - Scientific advisory boards
    - Legislators
    - WHO, PAHO, etc.

- Location: Lowell, MA
- Sector: Academia
- Action: Technology development, Increasing transparency and availability of research and other data
    - Written reply: develop TOF type analytical methods to measure the entire class of compounds; Industry needs to step forward and be transparent about the substances they are using, in what products, analytical standards, and breakdown chains. Industry needs to step forward and be transparent about the substances they are using, in what products, analytical standards, and breakdown chains.
- Barriers:

    - Resource Constraints
    - Policies and Politics
    - Competing priorities
    - Chemistry
    - Corporate behavior
    - Written reply: fed govt isn't taking the lead in developing standards and prioritizing all pfas - focusing on legacy chemicals doesn't get us where we need to go; transparency does not happen without drivers and regulation; the chemistry is complicated, industry hasn't shared what they know and is resistant to any class based approach. transparency does not happen without drivers and regulation
- Actors:
    - Industry
    - US government departments
    - Environmental advocacy organizations
    - Written reply: advocacy will drive it

- Location: Chapel Hill, NC
- Sector: Academia
- Action: Technology development, Research
    - Written reply: Bench Mark Dose Models; Develop appropriate preclinical to clinical translation modes to assess exposure and associated mechanism of action to illustrate potential human causal mechanisms
- Barriers:
    - Laws, regulation, and other government policies
    - Elements of time inherent to the chemical, biological, physical problem at hand
    - Lack of knowledge
    - Competing priorities
    - Scientific uncertainty
    - Crisis event demanding immediate action
- Actors:
    - Researchers
    - Scientific advisory boards
    - Public and environmental health practitioners and regulators
    - Multidisciplinary research teams and preclinial modelsrequired to assess and quantify all inputs and variance explained by inter-individual differneces in exposure and response outcome (genetics, epigenetics, metabolomics, microbiome)
    - Clinicians assessing patient who are trained in mediciene and environmental mediciene and genetics.
    - Regulatory bodies and risk assessors

- Location: Bethesda, MD
- Sector: Repurposed

- Actions: Healthcare or public health services
    - Written reply: Contact the Michigan Association for Local Public Health to identify a representative or two from a local health department in Michigan. Many have been dealing with this and other contamination for years. Also contact the National Association of County and City Health Officials. They have been surveying members about PFAS contamination.
- Barriers: None provided
- Actors: None provided

- Location: Fountain Valley, CA
- Sector: Government
- Actions: Healthcare or public health services, Increasing transparency and availability of research and other data
    - Written reply: Greater human biomonitoring, especially in impacted communities; Greater understanding of the presence of PFAS in consumer and industrial products
- Barriers:
    - Lack of knowledge
    - Financial capacity
    - Laws, regulations, and other government policies
    - Corporate behavior
- Actors:
    - Public health advocacy organizations
    - Clinicians
    - US government departments
    - Environmental advocacy organizations
    - Business

- Location: Federal Way, WA
- Sector: Academia
- Action: Research, Appropriations and funding,
    - Written reply: Fully characterize home exposure; Research funding
- Barriers:
    - Consumption and production patterns
    - Consumer demand
    - Scientific uncertainty
    - Competing priorities
- Actors:
    - Public and environmental health practitioners and regulators
    - Public health advocacy organizations
    - Researchers
    - Scientific advisory boards

- Location: Tucson, AZ
- Sector: Academia
- Action: Research
    - Written reply: take steps to understand the most vulnerable in terms of frequency and intensity of exposure and susceptibility; determine critical windows of exposure; determine exposures that are somewhat modifiable vs. non-modifiable
- Barriers:
    - Lack of knowledge
    - Competing priorities
    - Scientific uncertainty
- Actors:
    - Researchers
    - Research funders
    - Engineers

- Location: Storrs Mansfield, CT
- Sector: Academia
- Action: Research, Public-facing campaigns, Policy change
    - Written reply: Help state water agencies partner with universities to determine PFAS risks for their state; Provide guidance to homes reliant on residential wells on the need to test for PFAS; Shift from reactive to proactive - precautionary approach to prevent and regulate chemicals/pollutants/contaminants from entering the environment
- Barriers:
    - Financial capacity
    - Competing priorities
    - Non-crisis event
    - Scientific literacy
    - Laws, regulations and other government policies
    - Political context
    - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
    - Legislators
    - US government departments
    - Finance
    - Public and environmental health practitioners and regulators
    - Public health advocacy organizations

- Location: College Station, TX
- Sector: Academia

- Action: Research, Technology development, Regulation, Policy change, Increasing transparency and availability of research and other data
- Barriers:
    - Financial capacity
    - Lack of knowledge
    - Chemistry
- Actors:
    - Research funders
    - NASEM
    - Teachers

- Location: Trenton, NJ
- Sector: Government
- Action: Research
    - Written reply: Monitor PFAS in public water systems and private wells; biomonitoring of communities with exposure to PFAS contamination
- Barriers:
    - Laws, regulations, and other government policies
    - Political context
    - Economic conditions
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - US government departments
    - Social movements or grassroots organizations
    - Other non-governmental organizations
    - Research funders
    - Courts

- Location: Ottawa, ON
- Sector: Government
- Action: Research
    - Written reply: Targeted biomonitoring
- Barriers:
    - Financial capacity
    - Competing priorities
    - Scientific uncertainty
- Actors:
    - Industry
    - Research funders

- Location: Washington, DC
- Sector: Association
- Action: Research
    - Written reply: Research- there is a large gap in the research of understanding occupational exposures to PFAS. This can provide necessary information on how to protect communities.
- Barriers:
    - Resource constraints
    - Knowledge and uncertainty
    - Policies and politics
- Actors:
    - Private sector
    - Government and intergovernmental organizations
    - Scientists and experts

- Location: Lagos, Nigeria
- Sector: academia
- Action: research, scientific publications
    - Written reply: more research; information dissemination
- Barriers:
    - Resource Constraints
    - Knowledge and Uncertainty
    - Policies and Politics
    - Corporate Behavior
    - Scientific and Engineering Parameters (that constrain actions)
- Actors:
    - Research funders
    - Government and intergovernmental agencies
    - Media and communications
    - Researchers
    - NGOS and philanthropy

- Location: Jaffrey, NH
- Sector: Academia
- Action: Research
    - Written reply: Comprehensive assessment of the contributions of sources beyond drinking water
- Barriers:
    - Laws, regulations and other government policies
    - Consumption and production patterns
    - Lack of knowledge

- Actors:
    - Research funders
    - Engineers
    - Business

- Location: Houston, TX
- Sector: Industry
- Action: Research
    - Written reply: More research in understanding current exposure-Environmental and human monitoring
- Barriers:
    - Financial capacity
    - Lack of knowledge
    - Political context
- Actors:
    - Public and environmental health practitioners and regulators
    - Researchers
    - Industry

- Location: Houston, TX
- Sector: Industry
- Action: Research
    - Written reply: exposure avenues
- Barriers: None provided
- Actors: None provided

- Location: Philadelphia, PA
- Sector: Academia
- Action: Research
    - Written reply: Identify and quantify all exposure routes to PFASs (e.g., food, water, air)
- Barriers:
    - Lack of knowledge
    - Scientific uncertainty
    - Misinformation
- Actors:
    - Research funders
    - Researchers
    - Clinicians
    - Public and environmental health practitioners and regulators
    - Business

    - Industry
    - Legislators
    - Public health advocacy organizations
    - Environmental advocacy organizations

- Location: Not provided
- Sector: Government
- Action: Research
    - Written reply: Understanding exposure to humans could be enhanced through understanding exposure, biouptake, bioaccumulation, and effects on other animals (e.g. fish and wildlife) that might serve as sentinels.
- Barriers:
    - Research funders
    - Scientific advisory boards
    - Regulators
- Actors:
    - Researchers
    - Policy makers
    - Funding sources

- Location: Golden, CO
- Sector: Academia
- Action: Research
    - Written reply: Exposure Assessments
- Barriers:
    - Financial capacity
    - Crisis event demanding immediate action
- Actors: None provided

- Location: Not provided
- Sector: Government
- Action: Research
    - Written reply: Understanding PFAS exposures with the benefits of eating fish.
- Barriers:
    - Lack of knowledge
    - Competing priorities
- Actors:
    - Research funders
    - Researchers

- Location: Chicago, IL
- Sector: Philanthropy
- Action: Research
    - Written reply: Assess the impacts of multiple exposure pathways on human health (drinking water, recreational contact, consumption of fish and game, etc.)
- Barriers:
    - Resource constraints
- Actors:
    - Research funders
    - Public and environmental health practitioners and regulators
    - Grassroots organizations (to recruit study participants)

- Location: Isleboro, ME
- Sector: NGO
- Action: Research
    - Written reply: Evaluation of health impact - establishment of disability weight; Establish burden of disease, preliminarily, so as to enable a comparison with other public health risks
- Barriers:
    - Public perception
    - Political context
    - Lack of knowledge
    - Financial capacity
    - Competing priorities
- Actors:
    - NASEM
    - Researchers
    - US government departments
    - Research funders
    - Charitable foundations

- Location: Denver, CO
- Sector: Government
- Action: Research, Influence risk perception
    - Written reply: We need to understand that actual public health risks from different exposure routes at
- Barriers:
    - Scientific uncertainty
    - Competing priorities
    - Crisis event demanding immediate action
    - Charitable foundations
    - Political context

- Actors:
    - NASEM
    - Research funders
    - Researchers
    - Government and Intergovernmental Organizations
    - Individuals and Community Organizations
    - NGOs and Philanthropy
    - Public and environmental health practitioners and regulators
    - US government departments
    - Public health advocacy organizations
    - Clinicians
    - Faith groups
    - Civic organizations
    - Teachers
    - Informal learning (museums)

- Location: Towson, MD
- Sector: Academia
- Action: Research
    - Written reply: Systems analyses of multiple exposure pathhways
- Barriers:
    - Financial capacity
    - Lack of knowledge
    - Political context
- Actors:
    - Legislators
    - US government departments
    - Business
    - Industry
    - Charitable foundations
    - NASEM
    - Professional societies
    - Research funders
    - Researchers
    - Finance
    - Public health advocacy organizations
    - Environmental advocacy organizations

- Location: Ocean City, MD
- Sector: Academia
- Action: Research, Technology development

    - Written reply: Need more research to understand sources and exposure pathways; Much more widespread monitoring of releases, exposure media, and human biospecimens
- Barriers:
    - Insufficient understanding of the significance of the threat -- this is not like other chemical issues we have faced
    - Availability of truthful information about chemicals and uses. Much has been hidden by industry
    - Corruption of the government to act for economic interests
    - Need better methods for detection and quantification
    - Need commitment to develop and implement a strategy
    - Need resources and permissions
- Actors:
    - It starts with this committee and the scientific community.
    - I don't see any actor on the list who can fix this
    - Funding, strategy, commitment
    - Government, communities, business, media, NGOs
    - Congress, research infrastructure, etc

- Location: Breckenridge, CO
- Sector: NGO
- Action: Research, Modifying individual business practices and strategy
    - Written reply: More extensive monitoring of human exposure and source of PFAS measured in people; Industry should be responsible for evaluating potential health impacts of its chemicals/products, including potential for human exposure.
- Barriers:
    - EPA is not required to study and prevent harmful chemical exposures.
    - EPA actions on toxic chemicals are fragmented by media, and not always clear how to address concerning exposures.
    - EPA is tasked with reviewing single chemicals and ignores additive effects of closely related chemicals.
- Actors:
    - Environmental advocacy organizations
    - Professional societies
    - Industry
    - Legislators

- Location: Decatur, GA
- Sector: Government
- Action: Research
    - Written reply: BIOMONITORING
- Barriers:

    - Financial capacity
    - Misinformation
    - Political context
- Actors:
    - Legislators
    - Media and Communications

- Location: Not provided
- Sector: Industry
- Action: Secondary analyses and technical reports, National and international leadership and cooperation
    - Written reply: Close knowledge gap between compounds and byproducts manufactured and analytes forensically I should be looking for; Homogenize current state-by-state approaches to sampling and evaluating extent
- Barriers:
    - Financial capacity
    - Competing priorities
    - Lack of knowledge
    - Laws, regulation, and other government policies
    - Political viability of a policy option at specific point in time (Overton window)
- Actors:
    - Engineers
    - Scientific advisory boards
    - Industry
    - Legislators
    - US government departments

- Location: Not provided
- Sector: Consulting
- Action: Secondary analyses and technical reports
    - Written reply: establish fate & transport mechanism, quantify doses from different sources
- Barriers:
    - Scientific uncertainty
    - Competing priorities
    - Crisis event demanding immediate attention
- Actors:
    - Scientists and experts
    - US government
    - NGOs

- Location: Washington DC
- Sector: Industry
- Action: Secondary analyses and technical reports, Research, Guidance
    - Written reply: Clearer definition of the specific chemistries to be considered/addressed. PFAS encompasses a large group of chemicals with varying properties. Additional sampling to better define the extent of exposure; Use of the best science in evaluating the impacts of exposure
- Barriers:
    - Public perception
    - Political viability of a policy option at a specific point in time (Overton window)
    - Scientific uncertainty
    - Financial capacity
    - Laws, regulation, and other government policies
- Actors:
    - Legislators
    - Scientific advisory boards
    - Public health advocacy organizations
    - Professional societies
    - Researchers

- Location: Hastings, MN
- Sector: NGO
- Action: Regulation
    - Written reply: Eliminate production
- Barriers: None provided
- Actors: None provided

- Location: Philadelphia, PA
- Sector: Academia
- Action: Regulation, Research
    - Written reply: Identify the full range of exposures from commercial products; identify biomarkers of exposure; improved understanding of health impact
- Barriers:
    - Laws, regulation, and other government policies
    - Political context
    - Competing priorities
    - Financial capacity
    - Public perception
    - Scientific literacy
    - Misinformation
    - Non-crisis event

- Actors:
    - Research funders
    - Public and environmental health practitioners
    - Industry
    - Researchers
    - Public health advocacy organizations
    - Environmental advocacy organizations
    - Broadcast (radio, TV)
    - Print (news, magazines)
    - Online (Huffpost, Medium)
    - Social (Twitter, Facebook)
    - Teachers
    - Administrators
    - Informal learning (museums)
    - Legislators
    - Clinicians
    - Scientific advisory boards
    - Other non-governmental organizations
    - Charitable foundations

- Location: Sacramento, CA
- Sector: Government
- Action: Regulation, Increasing transparency and availability of research and other data
    - Written reply: Ban for specific applications; Know everywhere it is used - source identification
- Barriers:
    - Corporate behavior
    - Physics
    - Political context
- Actors:
    - US government departments
    - Scientific advisory boards
    - Business
    - Public and environmental health practitioners
    - Industry

- Location: Charlottesville, VA
- Sector: Consultant
- Action: Regulation
    - Written reply: Removal from the market
- Barriers: None provided
- Actors: None provided

- Location: Minneapolis, MN
- Sector: Consultant
- Action: Regulation
    - Written reply: EPA must enact the Precautionary Principle when reviewing chemicals to be allowed into distribution.
- Barriers:
    - Laws, regulation, and other government policies
    - Corporate behavior
    - Public perception
- Actors:
    - Scientific advisory boards
    - Public and environmental health practitioners and regulators
    - US government departments
    - Broadcast (radio, TV)
    - Business

- Location: Waldport, OR
- Sector: Formerly in electronics industry; currently in academia
- Action: Regulation, Developing industry standards
    - Written reply: establish regulatory thresholds; incentivize use of non-toxic materials in consumer products
- Barriers:
    - Corporate behavior
    - Political viability of a policy option at a specific point in time (Overton window)
    - Political context
    - Economic conditions
    - Public perception
    - Consumer demand
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - NASEM
    - US government departments
    - Public health advocacy organizations

- Location: Milwaukee, WI
- Sector: Academia
- Action: Regulation
    - Written reply: It is of utmost important that we rely on science produced and interpreted by independent scientists - ones who are not conflicted through financial

relationships with PFAS producers or users. So the action is to rely solely on independent science and scientists, and reject analyses provided by conflicted scientists.

- Barriers:
    - Misinformation
    - Corporate behavior
    - Political context
- Actors:
    - NASEM
    - Researchers
    - Government and Intergovernmental Organizations
    - Media and Communications
    - Scientists and Experts
    - Individuals and Community Organizations
    - NGOs and Philanthropy

- Location: Washington, DC
- Sector: Not provided
- Action: Regulation
    - Written reply: regulation
- Barriers: None provided
- Actors: None provided

- Location: Anchorage, AK
- Sector: Government
- Action: Regulation
    - Written reply: Standard regulation and updated FAA AFFF guidance for airports
- Barriers:
    - Laws, regulation, and other government policies
    - Political context
    - Financial capacity
- Actors:
    - Legislators
    - Courts
    - US government departments

- Location: Kingston, RI
- Sector: Academia
- Action: Regulation, Research
    - Written reply: Push for regulation on concentration limits in air, water, soil/sediment, and organisms for PFAS groups and their precursors; Establish alternatives to PFAS that are not detrimental for human health or the environment

- Barriers:
    - Competing priorities
    - Corporate behavior
    - Lack of knowledge
    - Financial capacity
- Actors:
    - Broadcast (radio, TV)
    - Industry
    - Legislators
    - Business
    - Civic organizations
    - Individuals
    - Social movements or grassroots organizations
    - Media and Communications
    - Private Sector

- Location: Leesburg, VA
- Sector: Consulting
- Action: Regulation
    - Written reply: Identify/assess the environmental and human health risk exposure, both past and future, and estimate the extent of risk to guide Govt regulation decisions.
- Barriers: None provided
- Actors: None provided

- Location: Littleton, CO
- Sector: Industry
- Action: Regulation
    - Written reply: Implement TSCA as Amended in 2016; Monitor All Public Water Supplies; Study Occupational Exposure
- Barriers:
    - Political context
    - Lack of knowledge
    - Financial capacity
    - Laws, regulation, and other government policies
    - Scientific uncertainty
- Actors:
    - US government departments
    - Courts
    - Researchers
    - Legislators
    - Public health advocacy organizations
    - Environmental advocacy organizations

    - Researchers
    - Professional societies
    - Scientific advisory boards
    - NASEM
    - Research funders

- Location: Traverse City, MI
- Sector: Industry
- Action: Regulation
    - Written reply: First, we need better analysis of the range of chemistries represented. Then, we need to phase out the PFAS that are environmentally persistent.
- Barriers:
    - Chemistry
    - Scientific uncertainty
    - Consumption and production patterns
- Actors:
    - Industry
    - US government departments
    - Researchers

- Location: Cáceres, Spain
- Sector: Academia
- Action: Regulation
    - Written reply: regulation of PFASs in water
- Barriers:
    - Laws, regulation, and other government policies
    - Political context
    - Competing priorities
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - Professional societies

- Location: East Falmouth, MA
- Sector: Retired marine scientist
- Action: Regulation
    - Written reply: Natural Resource Damage Assessment of PFAS in wildlife
- Barriers: None provided
- Actors: None provided

- Location: Portland, OR
- Sector: NGO
- Action: Regulation, Modifying individual business practices and strategy
    - Written reply: Ban production and use of all forms of nonessential PFAS; Government ban of all nonessential producrtion and uses of all forms of PFAS; Ban all production and use of all PFAS chemiclas unless medically necessary business must use alterntive safer chemicals
- Barriers:
    - Business
    - Industry
    - US Government
    - Laws, regulation, and other government policies
    - Lack of knowledge
- Actors:
    - Upper management
    - Legislators
    - Business leaders

- Location: Washington, DC
- Sector: Academia
- Action: Regulation
    - Written reply: Regulatory actions to eliminate uses of PFAS as a class
- Barriers:
    - Government policy
    - Corporate behavior
    - Researchers
- Actors:
    - EPA
    - Chemical Industry
    - NIH, EPA, CDC fund research to better document exposures and health impacts

- Location: Rockport, ME
- Sector: NGO
- Action: Legislation
    - Written reply: Federal funding to states that make this a requirement; for municipalities to receive the funding to test public water supplies, and an organization whether business or municipal sewer or similar that is selling sludge/fertilizer to a business selling or distributing their products to be tested for PFOAS/PFAS
- Barriers:
    - Competing priorities
    - Political context
    - Lack of knowledge

    - Misinformation
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - WHO, PAHO, etc.
    - US government departments
    - Researchers
    - Scientific advisory boards
    - Public health advocacy organizations
    - Teachers
    - Broadcast (radio, TV)
    - Print (news, magazine)
    - Online (Huffpost, Medium)
    - Social (Twitter, Facebook)

- Location: Los Angeles, CA
- Sector: Industry
- Action: Legislation
    - Written reply: identity sources/treatment of water
- Barriers:
    - No action
    - No regulation
    - Not enough research
- Actors:
    - Legislature
    - Regulatory agencies
    - Congress

- Location: Washington DC
- Sector: Government
- Action: Appropriations and funding; Other - F
    - Written reply: Use the large amount of information submitted to the US EPA and other regulatory agencies to understand shources, manufacturing locations, releases and properties. Most is claimed as TSCA CBI. Making htis health and Saftey information public will give the locations of all manufacturing and processing sites, many use sites. disposal methods and locations, toxicity info for 100s of PFAs chemicals, etc. Uder TSCA health and saftey information is not CBI. EPA action to make it public is necessary. Need to understand th eshources and environmental degradation processes to understand the chemicals present is any specific media and their fate and transport. Much of this informaton exists in EPA dockets, files and the gray literature. Don't reinvent the wheel. Use what already exists.
- Barriers:

    - Industry
    - Government senior decision makers
- Actors: None provided

- Location: Washington DC
- Sector: NGO
- Action: Guidance
    - Written reply: Legislation requiring a transition to fluorine-free firefighting foam must contain provisions or allow for longer foam transition timeframes to allow for the development of foams that are compatible with each other. It is crucial that facilities maintain firefighting capabilities without having to maintain multiple foams, equipment sets, and fire-fighting approaches.
- Barriers: None provided
- Actors: None provided

- Location: Columbus, OH
- Sector: Industry
- Action: Guidance
    - Written reply: Government agencies such as CDC can run studies to collect data about exposure risks and actual exposure across a variety of populations and samples
- Barriers:
    - Resource constraints
    - Laws, regulation, and other government policies
    - Scientific uncertainty
- Actors:
    - US government departments
    - Legislators
    - Teachers

- Location: Washington, DC
- Sector: Government
- Action: National and international leadership and cooperation
    - Written reply: Technology Development, technical reports, national and Intl. leadership and cooperation
- Barriers: None provided
- Actors: None provided

- Location: Portland, OR
- Sector: Healthcare

- Action: Social media (Twitter, Facebook, Instagram)
    - Written reply: Educate and inform the public about the issue
- Barriers:
    - Lack of knowledge (public)
    - Misinformation
    - Lack of interest/apathy
- Actors:
    - Public health advocacy organizations
    - Teachers

- Location: Fairfax, VT
- Sector: Academia
- Action: Modifying individual business practices and strategy, Influence risk perception
    - Written reply: Why are PFASs in the environment to begin with; Individuals need to understand how these contaminants are ubiquitous in the environment and should be encouraged to engage on environmental exposures
- Barriers:
    - Business practice
    - Political context and policy
    - Consumer demand
    - Consumption and production patterns
    - Lack of knowledge
    - Scientific uncertainty
- Actors:
    - Industry
    - Government
    - Consumers
    - Research funders
    - Public health advocacy organizations
    - Environmental advocacy organizations

- Location: Lakewood, NJ
- Sector: Academia
- Action: Shaping supply chain activities, Increasing transparency and availability of research and other data
    - Written reply: Characterize all forms of potential exposure, including by consumer using materials containg PFAs and workers in industries where PFAs are produced or part of industrial equipment; What are the specific sources of water and ground impact?
- Barriers:
    - Competing priorities
    - Consumption and production patterns
    - Laws, regulation, and other government policies

    - Political viability of a policy option at a specific point in time (Overton window)
    - Corporate behavior
    - Scientific literacy
- Actors:
    - Researchers
    - Public and environmental health practitioners
    - Environmental advocacy organizations
    - Courts
    - Professional societies
    - Teachers

- Location: Pleasant Ridge, MI
- Sector: Foundation
- Action: Other - D
    - Written reply: Engage impacted communities in solutions
- Barriers: None provided
- Actors: None provided

- Location: Arlington, VA
- Sector: NGO
- Action: Other – F, Regulation, Technology Development
    - Written reply: Correctly describe the problem - Survey representation of primary exposure is incorrect except for some specific locales. Effective use of TSCA to collect data to inform decision-making and effectively control harmful exposure; Develop models for fate and transport that are appropriate to the chemical properties of PFAS compounds
- Barriers:
    - Scientific uncertainty as to which exposure routes are most significant at national level
    - Scientific uncertainty as to health consequences of ng level exposures / cumulative impact on health
    - Impatience and lack of funding to accumulate necessary data
    - Federal TSCA program funding levels
    - Policy concern that if authority is used in this instance it might be misapplied in future
    - Lack of shared view that PFAS are sufficiently toxic to warrant dramatic action
    - Inadequate public information on chemical properties
    - Inadequate problem formulation to guide model development
    - Inadequate funding
- Actors:
    - Federal regulators
    - Manufacturers of PFAS compounds and industrial/commercial users
    - Research community
    - Policy discussion leaders / influencers

- Research funders
- Regulatory agencies

Treatment

This section includes input from respondents who said "yes" to the question, "Would you like to provide input on actions, barriers, and actors related to treatment for PFAS exposure?"

- Location: Ottowa, ON
- Sector: Innovation and collaboration using a sustainable blockchain sense 1995
- Treatment medium: Water
- Action: Technology development
    - Written reply: As water is the key to susrvivil with 10 billion people, then we have to address waste first. AS community and money see it as a dumping ground out of sit out of mone. until it aproblem and you get love canel and various area in the U.S no longer productive due to polution yet no accountablity as money drive the agenda nothing wrong with that if accountable not to money but the Global community. .AS in atechnology and G35 world that has no border. Just barrier to fix problems due to money and self interest driveing the agenda and the problems are the community and gobvernent started decades ago and now beyond money ability to address. so require a new means of accoutnability Blockchain bring
- Barriers:
    - Market Forces
    - Policies and Politics
    - Resource Constraints
- Actors:
    - NGOs and Philanthropy
    - Media and Communications
    - Government and Intergovernmental Organizations
    - Education and Informal Learning
    - Individuals and Community Organizations
    - Private Sector

- Location: West Richland, WA
- Sector: Government
- Medium: Water
- Action: Technology development, Regulation
    - Written reply: scientific, engineering
- Barriers:
    - Chemistry
    - Biology
    - Engineering
- Actors:
    - Researchers
    - Engineers

    - Public and environmental health practitioners and regulators

- Location: San Francisco, CA
- Sector: NGO
- Medium: Water
- Action to be taken: Collective action
    - Written reply: Need to recoup costs of treatment from the chemical manufacturers.
- Barriers:
    - Corporate behavior
    - Crisis event demanding immediate action
    - Political context
- Actors:
    - Courts
    - Other non-governmental organizations
    - Civic organizations

- Location: Columbus, OH
- Sector: NGO
- Medium: Air/other
- Action: Technology development
    - Written reply: Develop palliative measures to treat human exposures
- Barriers:
    - Financial capacity
    - Lack of knowledge
- Actors:
    - Research funders
    - Researchers
    - Clinicians
    - Scientific advisory boards
    - Public and environmental health practitioners and regulators

- Location: Chapel Hill, NC
- Sector: NGO
- Medium: Water
- Action: Catalyzing and supporting innovation, Research
    - Written reply: Treat discharge points rather than solely contaminated areas; Develop rapid assessment analytical methodologies
- Barriers:
    - Competing priorities
    - Lack of knowledge
    - Scientific uncertainty
    - Financial capacity

- Actors:
    - Scientific funders
    - Researchers
    - Engineers
    - Scientific advisory boards
    - US government departments

- Location: Madison, WI
- Sector: NGO
- Medium: Soil/biosolids
- Action: Technology development
    - Written reply: Development of a complete destruction technology for PFAS
- Barriers:
    - Financial capacity
    - Scientific uncertainty
    - Mathematics/engineering
- Actors:
    - Research funders
    - US government departments
    - Industry
    - Engineers
    - NASEM
    - Researchers
    - Think tanks

- Location: Lowell, MA
- Sector: Academia
- Medium: Water
- Action: Technology development
    - Written reply: intensive research is needed on treating contaminated water, particularly when it is contaminated by multiple PFAS of different chain length and structure.
- Barriers:
    - Financial capacity
    - Chemistry
- Actors:
    - Industry
    - US government departments
    - Research funders
    - Researchers

- Location: Fountain Valley, CA
- Sector: Government
- Medium: Water

- Actions: Technology development, Regulation
    - Written reply: PFAS selective sorption material; Development of cost-effective PFAS destruction technologies; Removal of PFAS from conventionally treated wastewater
- Barriers:
    - Scientific uncertainty
    - Chemistry
    - Economic conditions
    - Financial capacity
    - Political viability of a policy option at a specific point in time (Overton window)
    - Laws, regulations, and other government policies
- Actors:
    - Researchers
    - US government departments
    - Industry
    - Public and environmental health practitioners and regulators
    - Environmental advocacy organizations

- Location: Federal Way, WA
- Sector: Academia
- Medium: Soil/biosolids
- Action: Regulation
    - Written reply: Source control
- Barriers:
    - Laws, regulation, and other government policies
    - Consumption and production patterns
    - Scientific literacy
- Actors:
    - Professional societies
    - Engineers
    - Scientific advisory boards
- Location: Tucson, AZ
- Sector: Academia
- Medium: Water
- Action: Research
    - Written reply: Research on separation methods, research, and destruction
- Barriers:
    - Lack of knowledge
    - Financial capacity
    - Competing priorities
- Actors:
    - Researchers
    - Research funders
    - NASEM

- Location: College Station, TX
- Sector: Academia
- Medium: Water
- Action: Technology development, Regulation, Guidance, Research
- Barriers:
    - Lack of knowledge
    - Scientific uncertainty
    - Laws, regulations, and other government policies
- Actors:
    - Research funders
    - Researchers
    - Industry

- Location: Trenton, NJ
- Sector: Government
- Medium: Water
- Action: Technology development
    - Written reply: Develop approaches to destroy PFAS, not just remove them so that they will need to be disposed of elsewhere
- Barriers:
    - Scientific/engineering parameters
    - Funding to develop new technologies
- Actors:
    - Researchers
    - Engineers
    - Research funders
    - US government departments
    - Industry

- Location: Washington, DC
- Sector: Association
- Medium: Water
- Action: Modifying individual business practices and strategy
    - Written reply: Containment and clean up of PFAS laden AFFF fire fighting foam
- Barriers:
    - Resource Constraints
    - Knowledge and Uncertainty
    - Scientific or Engineering Parameters (that constrain action)
- Actors:
    - Private Sector
    - Government and Intergovernmental Organizations

    - Scientists and Experts

- Location: Lagos, Nigeria
- Sector: Academia
- Medium: Water
- Action: Research, Scientific publications
    - Written reply: Management of waste water as source
- Barriers:
    - Lack of knowledge
    - Policies and politics
    - Corporate behavior
- Actors:
    - Government and Intergovernmental Agencies
    - Scientists and Experts
    - Environmental advocacy organizations

- Location: Houston, TX
- Sector: Industry
- Medium: Water
- Action: Technology development
    - Written reply: Technology development and implementation
- Barriers:
    - Financial
    - Lack of knowledge
    - Laws and regulation-drivers for this effort
- Actors:
    - Researchers
    - Legislators
    - Industry

- Location: Philadelphia, PA
- Sector: Academia
- Medium: Water
- Action: Technology development, Appropriations and funding
    - Written reply: Defining Treatment Goals; Funding and infrastructure to evaluate performance of treatment technologies (i.e., analytical equipment, core labs)
- Barriers:
    - Financial capacity
    - Lack of knowledge
    - Elements of time inherent to the chemical, biological, physical problem at hand

- Actors
    - Research funders
    - Researchers
    - Clinicians
    - Public and environmental health practitioners and regulators
    - Business
    - Industry
    - Legislators
    - Charitable foundations
    - Individual donors
    - Engineers

- Location: Not provided
- Sector: Government
- Medium: Water
- Action: Research
    - Written reply: What is the relative benefit of treating water vs exposure from other media?
- Barriers:
    - Public and environmental health practitioners
    - Research
- Actors:
    - Researchers
    - Policy makers
    - Funding sources

- Location: Denver, CO
- Sector: Government
- Medium: Water
- Action: Appropriations and funding
    - Written reply: We need to find a viable an affordable option for small systems and private well owners to treat their water
- Barriers:
    - Financial capacity
    - Laws, regulation, and other government policies
    - Political context
    - Chemistry
    - Physics
    - Biology
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators

    - US government departments
    - Individuals and Community Organizations
    - NGOs and Philanthropy

- Location: Towson, MD
- Sector: Academia
- Medium: Water
- Action: Technology development
    - Written reply: Stste of the art treatment/removal
- Barriers:
    - Lack of knowledge
    - Economic conditions
    - Political context
- Actors:
    - NASEM
    - Research funders
    - Researchers
    - Engineers
    - Industry
    - Public and environmental health practitioners and regulators
    - Legislators
    - US government departments
    - Business
    - Finance
    - Public health advocacy organizations
    - Environmental advocacy organizations
    - Charitable foundations

- Location: Breckenridge, CO
- Sector: NGO
- Medium: Air/other
- Action: Research, Legislation
    - Written reply: Industry/govt must prove that thermal destruction breaks PFAS into harmless components; Ensure liability for improper treatment/disposal of PFAS wastes
- Barriers:
    - chemistry methods to measure PFAS thermal breakdown products in ideal and real world conditions
    - engineering processes to maintain incineration in proper conditions for optimal breakdown
    - scientific uncertainty about the impacts of PFAS on harmful greenhouse gas emissions
    - lack of knowledge of the problems posed by PFAS incineration
    - misinformation about the safety of hazardous waste incineration for PFAS

    - little independent science on thermal disposal
- Actors:
    - independent scientific research
    - legislation to curtail unchecked PFAS incineration
    - regulators create liability for hazardous methods to destroy PFAS stockpiles
    - environmental advocates can help raise public attention to the history of problems with hazardous waste incineration and siting issues
    - legislators should demand accountability from the Department of Defense in its move to incinerate 2 million gallons of PFOS fire fighting foams
    - regulators and government agencies must ensure PFAS are safely contained and fully destroyed

- Location: Not provided
- Sector: Industry
- Medium: Water
- Action: Technology development
    - Written reply: Find cost-effective destruction technologies; Identify cost-effective ways to treat public water (point-of-entry and municipal)
- Barriers:
    - Financial capacity
    - Chemistry
    - Mathematics/engineering
    - Public perception
- Actors:
    - Research funders
    - Researchers
    - Engineers
    - Public and environmental health practitioners and regulators

- Location: Washington DC
- Sector: Industry
- Medium: Water
- Action: Guidance
    - Written reply: Clearer understanding of what we are trying to accomplish
- Barriers:
    - Political viability of a policy option at a specific point in time (Overton window)
    - Public perception
    - Competing priorities
- Actors:
    - Legislators
    - Public health advocacy organizations
    - Engineers

- Location: Sacramento, CA
- Sector: Government
- Medium: Air/other
- Action: Regulation
  - Written reply: Ban use in consumer products
- Barriers:
  - Corporate behavior
  - Laws, regulation, and other government policies
  - Physics
- Actors:
  - Civic organizations
  - Scientific advisory boards
  - Individuals

- Location: Waldport, OR
- Sector: Formerly in electronics industry; currently in academia
- Medium: Water
- Action: Regulation
  - Written reply: Eliminate PFAS from entering environment (I.e., ban its use in comsumer products)
- Barriers:
  - Political context
  - Corporate behavior
  - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
  - US government departments
  - NASEM
  - Public health advocacy organizations

- Location: Washington, DC
- Sector: Not provided
- Medium: Air/other
- Action: Research
  - Written reply: research
- Barriers: None provided
- Actors: None provided

- Location: Anchorage, AK
- Sector: Government

- Medium: Soil/biosolids
- Action: Technology development
    - Written reply: Additional pilot studies on preventing PFAS transport through the groundwater.
- Barriers:
    - Financial capacity
    - Elements of time inherent to the chemical, biological, physical problem at hand
    - Chemistry
- Actors:
    - Research funders
    - Researchers

- Location: Littleton, CO
- Sector: Industry
- Medium: Soil/biosolids
- Action: Regulation, Policy change, Legislation
    - Written reply: Update Biosolids Regulation at 503; Enhance Pretreatment Implementation; Establish State or Federal Funds for Cleanup Grants
- Barriers:
    - Competing priorities
    - Public perception
    - Political context
    - Corporate behavior
    - Laws, regulation, and other government policies
- Actors:
    - Legislators
    - Researchers
    - Professional societies
    - Public and environmental health practitioners and regulators
    - NASEM
    - Public health advocacy organizations
    - Environmental advocacy organizations
    - Clinicians
    - Scientific advisory boards

- Location: Traverse City, MI
- Sector: Industry
- Medium: Soil/biosolids
- Action: Regulation
    - Written reply: removal of PFAS from heavily contaminated sites
- Barriers:

    - Scientific uncertainty
    - Competing priorities
    - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
    - US government departments
    - Engineers
    - Researchers

- Location: Washington DC
- Sector: Government
- Medium: Water
- Action: Policy change
    - Written reply: Do not focus on PFOA anPFOS. They are the most studies but are only a small portion of the PFAS present in any media at any location. Only focusing on carboxylic acids and sulfonic acids very greatly
- Barriers: None provided
- Actors: None provided

- Location: Arlington, VA
- Sector: NGO
- Medium: Water
- Action: Technology Development
    - Written reply: Properly characterize the problem - Treatment begins (assuming release to media has not been prevented) with treatment prior to release to sewer / solid waste / air. Then treatment of the media itself. Then treatment of the media prior to use. Each step in process has different constraints. Prioritization of PFAS based on toxicity and volume released; Management of residuals from treatment (moving harmful PFAS from one media to another is pointless)
- Barriers:
    - Lack of transparency in risk management policy discussion around PFAS
    - Legal responsibilities in current regulatory framework
    - Inadequate funding
    - Lack of adequate information on PFAS production and use
    - Lack of understanding of PFAS toxicity
    - Lack of understanding of PFAS chemical characterisitics
    - Lack of analytical methods for PFAS compounds of interest, or reliable and generally available broad spectrum or surrogate test method
    - Developing an appropriate analytical method requires understanding what analytes to target
    - Funding to accomplish research in a timely fashion
- Actors:
    - Policy leaders / influencers

    - Research funders
    - Engineers
    - Manufacturers and Industrial/Commercial Users
    - Regulators (TSCA)
    - Researchers (toxicologists and engineers)
    - Research funding agencies
    - Policy dialogue leaders / influencers
    - Researchers (toxicologists, analytical chemist, engineers)

- Location: Nairobi, Kenya
- Sector: NGO
- Medium: Water
- Action: Public comment, Catalyzing and supporting innovation
    - Written reply: Water is life and if messed up can be a danger to humanity. I would suggest preventing careless water management. I realized in coast region they direct sewer into the ocean which makes is dangerous to humanity and also animals which use the ocean. I would think its wise to use advocacy for understanding and put management strategy to help this cause. Water treatment and proper drainage instalment
- Barriers:
    - Lack of knowledge
    - Economic conditions
    - Corporate behavior
    - Financial capacity
    - Competing priorities
- Actors:
    - Environmental advisory organizations
    - Finance
    - Public health advocacy organizations
    - Individual donors
    - Scientific advisory boards

Prevention

This section includes input from respondents who said "yes" to the question, "Would you like to provide input on actions, barriers, and actors related to prevention of PFAS exposure?"

- Location: Ottowa, ON
- Sector: Innovation and collaboration using a sustainable blockchain sense 1995
- Prevention aspect: Essential uses
- Action: Modifying individual business practices and strategy
    - Written reply: Where were they used in the past, how can the public protect themselvies, inow to address their proesent use to protect the enviorment and people,Is their a subsitute if not hoow can we limit the damge and not do more harm thena good. That will require innovation and alot collaboration not sure the poltical will is their. As money and self interest seem to drive the agenda not common sense anymore to problem solving.
- Barriers:
    - Time
    - Market Forces
    - Resource Constraints
    - Policies and Politics
    - Knowledge and Uncertainty
- Actors:
    - NGOs and Philanthropy
    - Education and Informal Learning
    - Media and Communications
    - Individuals and Community Organizations
    - Government and Intergovernmental Organizations
    - Private Sector

- Location: San Francisco, CA
- Sector: NGO
- Prevention aspect: Regulatory measures
- Action: Shaping supply chain activities, Legislation, Regulation
    - Written reply: Classify uses of PFAS as "essential" or "non-essential"; update classifications every 5 years; Once PFAS uses are classified as "essential" or "non-essential", take legislative action to phase out all non-essential uses; Identify PFAS as a class in multiple product categories as priority products under California's Safer Consumer Products Program
- Barriers:
    - Competing priorities
    - Corporate behavior consumer demand
    - Laws, regulations, and other government policies

    - Political context
    - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
    - NASEM
    - Engineers
    - Business
    - Environmental advocacy organizations
    - Charitable foundations
    - Social movements or grassroots organizations
    - Public health advocacy organizations
    - Public and environmental health practitioners

- Location: Madison, WI
- Sector: NGO
- Prevention aspect: Regulatory measures
- Action: Regulation
    - Written reply: Class-based approach to addressing PFAS
- Barriers:
    - Laws, regulation, and other government policies
    - Political context
    - Biology
- Actors:
    - NASEM
    - Scientific advisory boards
    - Legislators
    - Professional societies
    - Think tanks
    - Public and environmental health practitioners and regulators
    - Business
    - Industry
    - Broadcast (radio, TV)
    - Print (news, magazines)

- Location: Lowell, MA
- Sector: Academia
- Prevention aspect: Essential uses
- Action: Regulation
    - Written reply: public policy: who decides what are essential uses? how do we move forward when society or government has decided that a particular function/product is not essential? I chose gov't regulation below, but a systems change is also necessary, and the actors could be others if gov't doesn't take action
- Barriers:

    - Consumption and production patterns
    - Corporate behaviors
    - Misinformation
    - Scientific uncertainty
    - Competing priorities
    - Lack of knowledge
    - Political viability of a policy option at a specific point in time (Overton window)
    - Crisis event demanding immediate action
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - US government departments
    - Business
    - Public health advocacy organizations
    - Environmental advocacy organizations
    - Broadcast (radio, TV)
    - Print (news, magazines)
    - Online (Huffpost, Medium)
    - Researchers
    - Engineers
    - Industry

- Location: Federal Way, WA
- Sector: Academia
- Prevention aspect: Essential uses
- Action: Modifying individual business practices and strategy, Regulation
    - Written reply: avoid including them in products, regulate use
- Barriers:
    - Consumption and production patterns
    - Laws, regulation and other government policies
    - Competing priorities
- Actors:
    - Scientific advisory boards
    - Public and environmental health practitioners and regulators
    - US government departments
    - Engineers

- Location: Tucson, AZ
- Sector: Academia
- Prevention aspect: Chemical or functional alternatives
- Action: Technology development
    - Written reply: life cycle assessment, green chemistry

- Barriers:
    - Lack of knowledge
    - Laws, regulation, and other government policies
    - Chemistry
- Actors: None provided

- Location: College Station, TX
- Sector: Academia
- Prevention aspect: Chemical and functional alternatives
- Action: Technology development
- Barriers:
    - Competing priorities
    - Consumption and production patterns
    - Consumer demand
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - US government departments

- Location: Trenton, NJ
- Sector: Government
- Prevention aspect: Regulatory measures
- Action: Regulation
    - Written reply: Require industrial users to cease discharging PFAS to the environment
- Barriers:
    - Laws, regulations, and other government policies
    - Political context
- Actors:
    - Public and environmental health practitioners and regulators
    - Legislators
    - Courts
    - US government departments
    - Environmental advocacy organizations
    - Individuals
    - Social movements or grassroots organizations

- Location: Washington, DC
- Sector: Association
- Prevention aspect: Chemical or functional alternatives
- Action: Regulation

    - Written reply: There are safer alternatives on the market that should be used.
- Barriers:
    - Resource Constraints
    - Politics and Policies
    - Knowledge and Uncertainty
- Actors:
    - Private Sector
    - Government and Intergovernmental Organizations
    - Scientists and Experts

- Location: Lagos, Nigeria
- Sector: Academia
- Prevention aspect: Regulatory measures
- Action: Technology development
    - Written reply: Regulatory action
- Barriers:
    - Corporate behavior
    - Consumption and production patterns
    - Policies and Politics
- Actors:
    - Scientists and Experts
    - Environmental advocacy organizations
    - Government and intergovernmental agencies

- Location: Houston, TX
- Sector: Industry
- Prevention aspect: Chemical or functional alternatives
- Action: Research
    - Written reply: A more robust effort is needed to identify replacement chemistries/ perhaps non-flourinated that can be used safely in products, etc
- Barriers:
    - Consumer demand
    - Lack of knowledge
    - Political context
- Actors:
    - Regulators
    - Researchers
    - Industry

- Location: Golden, CO

- Sector: Academia
- Prevention aspect: Regulatory measures
- Action: Regulation
    - Written reply: Class-level regulation
- Barriers:
    - Corporate behavior
- Actors:
    - US government departments

- Location: Towson, MD
- Sector: Academia
- Prevention aspect: Regulatory measures
- Action: Policy change
    - Written reply: source water protection/monitorin
- Barriers:
    - Corporate behavior
    - Laws, regulation, and other government policies
    - Political context
- Actors:
    - Business
    - Industry
    - Public and environmental health practitioners and regulators
    - Legislators
    - Courts
    - US government departments
    - Public health advocacy organizations
    - Broadcast (radio, TV)

- Location: Breckenridge, CO
- Sector: NGO
- Prevention aspect: Regulatory measures
- Action: Technology development
    - Written reply: Replace industrial uses of PFAS with safer alternatives
- Barriers:
    - there are virtually no laws requiring industry to limit use and emissions of PFAS chemicals
    - there is little political will to push industry to innovate and develop safer alternatives
    - There is too much secrecy around present day uses of PFAS in industry and consumer uses
- Actors: None provided

- Location: Not provided
- Sector: Industry
- Prevention aspect: Chemical or functional alternatives
- Action: Research
    - Written reply: Quantify toxicity of replacement chemistries
- Barriers:
    - Financial capacity
    - Laws, regulation, and other government policies
    - Lack of knowledge
- Actors:
    - Research funders
    - Public and environmental health practitioners and regulators
    - Industry

- Location: Not provided
- Sector: Consulting
- Prevention aspect: Regulatory measures
- Action: Technology development
    - Written reply: Eliminate the sources
- Barriers:
    - Industry
    - Business
    - Government
- Actors:
    - Scientists
    - Regulators
    - NGOs

- Location: Sacramento, CA
- Sector: Government
- Prevention aspect: Essential uses
- Action: Modifying individual business practices and strategy
    - Written reply: ID truly essential uses of small amounts, if any
- Barriers:
    - Corporate behavior
    - Physics
    - Biology
- Actors:
    - Public and environmental health practitioners and regulators
    - Business
    - Other non-governmental organizations

- Location: Waldport, OR
- Sector: Formerly in electronics industry; currently in academia
- Prevention aspect: Regulatory measures
- Action: Regulation
    - Written reply: Ban the use PFAS in consumer products
- Barriers:
    - Laws, regulation, and other government policies
    - Corporate behavior
    - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
    - US government departments
    - Public health advocacy organizations
    - NASEM

- Location: Washington, DC
- Sector: Not provided
- Prevention aspect: Essential uses
- Action: Research
    - Written reply: research
- Barriers: None provided
- Actors: None provided

- Location: Anchorage, AK
- Sector: Government
- Prevention aspect: Essential uses
- Action: Policy change
    - Written reply: Update FAA regulations that requires airports to use PFAS containing AFFF
- Barriers:
    - Political context
    - Laws, regulation, and other government policies
    - Consumption and production patterns
- Actors:
    - Legislators
    - Courts
    - Industry

- Location: Littleton, CO
- Sector: Industry
- Prevention aspect: Regulatory measures
- Action: Policy change, Legislation, Regulation
    - Written reply: Implement TSCA as Amended in 2016; State Product Bans; Prevent Occupational Exposure
- Barriers:
    - Political context
    - Scientific uncertainty
    - Laws, regulation, and other government policies
- Actors:
    - US government agencies
    - Scientific advisory boards
    - Legislators
    - Lack of knowledge
    - NASEM
    - Research funders
    - Researchers
    - Scientific advisory boards

- Location: Traverse City, MI
- Sector: Industry
- Prevention aspect: Chemical or functional alternatives
- Action: Research
    - Written reply: there are other options for most or all PFAS uses, but these need to be studied to ensure that the substitutions are appropriate
- Barriers:
    - Competing priorities
    - Corporate behavior
- Actors:
    - Industry
    - Researchers

- Location: Cáceres, Spain
- Sector: Academia
- Prevention aspect: Essential uses
- Action: Regulation
    - Written reply: Remove non-essential PFASs from use
- Barriers:
    - Political context
    - Corporate behavior

    - Laws, regulation, and other government policies
- Actors:
    - Public and environmental health practitioners and regulators
    - Industry
    - Business

- Location: Portland, OR
- Sector: NGO
- Prevention aspect: Regulatory measures
- Action: Regulation
    - Written reply: Other-C
- Barriers:
    - Business putting profits over health
    - Legislators ignorant of basic science and health information
- Actors:
    - Consumer pressure
    - Constituents educate legislators

- Location: Washington, DC
- Sector: Academia
- Prevention aspect: Chemical or functional alternatives
- Action: Technology development
    - Written reply: Identify alternatives that are nonpersistent and nontoxic
- Barriers:
    - Regulatory--inadequate incentive to innovate
    - Market forces -- inadequate demand for safer alternatives
    - Science -- inadequate suppor for research to identify greener alternatives
- Actors:
    - EPA, consumers, chemicals industry, chemical users
    - Clinicians, consumers, scientists, retailers, media, advocacy organizations
    - NSF, EPA, NIH, industry prioritize funding for green chemistry/engineering

- Location: Washington DC
- Sector: Government
- Prevention aspect: Chemical or functional alternatives
- Action: Policy change
    - Written reply: Based on the question it appears that this effort is missing the large majority of PFAS cheimcals. It is likely to be of very limited value unles it is expanded to include the per and polyfluoroethers, side chain polymers, dgradable PFAS chemicals, and other interrelated fluorocarbon chemistry. It appears to be base don 15 year old

understanding and thinking. It does not appear to take into account current science and understanding. Attempts to reinvent the wheel are not helpful. Any effort should start with a strong, up-to-date understanding of the science and industrial processes.

- Barriers:
    - Lack of up-to-date knowledge
    - Not-invented here thinking
    - Poor understanding of current information
- Actors:
    - NASEM
    - Govt. decisionmakes
    - Academics

- Location: Fairfax, VT
- Sector: Academia
- Prevention aspect: Collective action
- Action: Modifying individual business practices and strategy, Influence risk perception
    - Written reply: Regulatory activities around chemical exposures are leading to a "death by a thousand cuts" situation
- Barriers:
    - Consumption and production patterns
    - Political context
    - Political viability of a policy option at a specific point in time (Overton window)
- Actors:
    - Public and environmental health practitioners and regulators
    - Researchers
    - Public health advocacy organizations

- Location: Lakewood, NJ
- Sector: Academia
- Prevention aspect: Essential uses
- Action: Media (earned, e.g. press releases or coverage, or paid e.g. online or broadcast advertising)
    - Written reply: Reduce production of PFAS products
- Barriers:
    - Misinformation
    - Consumption and production patterns
    - Consumer demand
- Actors:
    - Environmental advocacy organizations
    - Other non-governmental organizations
    - Think tanks

- Location: Arlington, VA
- Sector: NGO
- Prevention aspect: Regulatory measures
- Action: Regulation
    - Written reply: Retrospective analysis of PFAS approved under TSCA
- Barriers:
    - Manufacturers providing data to support analysis
    - Regulators having adequate time and resources to conduct an effective analysis
    - Policy makers being willing to utilize such an analysis
- Actors:
    - Policy discussion leaders / influencers
    - PFAS manufacturers and users
    - EPA TSCA program

- Location: Richmond, VA
- Sector: Government
- Prevention aspect: Essential uses
- Action: Behavior change
    - Written reply: Individual change
- Barriers: None provided
- Actors: None provided

- Location: Nairobi, Kenya
- Sector: NGO
- Prevention aspect: Essential uses
- Action: Other - B
    - Written reply: Educate people on the dangers of poor waste water disposal and his to treat water before consumption .
- Barriers:
    - Lack of knowledge
    - Misinformation
    - Public perception
- Actors:
    - Finance
    - Civic organizations
    - Individual donors

- Location: Vineyard Haven, MA
- Sector: Foundation
- Prevention aspect: Chemical or functional alternatives

- Action: Other - A
    - Written reply: Teach chemists green/safe/clean chemistry so they design toxicity out. Stop with the reactivity where planetary toxification is concerned.
- Barriers:
    - Scientific literacy
- Actors:
    - Professional societies
    - Researchers
    - Teachers
    - Administrators
    - Public health advocacy organizations
    - Environmental advocacy organizations
    - Other non-governmental organizations
    - Charitable foundations
    - US government departments
    - Industry

- Location: Washington, DC
- Sector: Not provided
- Prevention aspect: Essential uses
- Action: Developing industry standards
    - Written reply: best practices
- Barriers: None provided
- Actors: None provided

- Location: Washington, DC
- Sector: Association
- Prevention aspect: Chemical or functional alternatives, Regulatory measures, Essential uses
- Action: Legislation, Technology development, Making public commitments
    - Written reply: Legislation requiring a transition to fluorine-free firefighting foam must contain provisions or allow for longer foam transition timeframes to allow for the development of foams that are compatible with each other. It is crucial that facilities maintain firefighting capabilities without having to maintain multiple foams, equipment sets, and fire-fighting approaches. Legislation requiring a transition to fluorine-free firefighting foam must contain provisions or allow for longer foam transition timeframes to allow for the development of foams that are compatible with each other. It is crucial that facilities maintain firefighting capabilities without having to maintain multiple foams, equipment sets, and fire-fighting approaches. Currently no synthetic fluorine-free foam has been proven as a suitable "drop in" replacement for existing foams. The performance variations in the synthetic fluorine-free foams clearly indicate that not all such foams are equivalent. Government and private industry need to coordinate on the development and evaluation of fluorine free alternatives for firefighting foams. Work has been ongoing at the National Fire Protection Association)NFPA) as well as the Large

Atmospheric Storage Tank Fires Consortium (LASTFIRE). Federal agencies, such as FEMA's US Fire Administration, DoD, and the White House Office of Science and Technology Policy should be involved to ensure alternatives meet performance standards, and human and environmental health criteria. (Note: SERDP and ESTCP have just announced a 2019 call for proposal to develop and demonstrate fluorine-free foam); Industries and Federal Agencies which rely on firefighting foams to maintain the capabilities necessary to protect lives, should develop and adhere to operational controls to minimize discharge to the environment. At a high level, this would include using fluorine-free alternatives when practicable, and utilizing appropriate management practices when fluorinated foams must be used.

- Barriers:
    - Political context
    - Public perception
    - Political viability of a policy option at a specific point in time
    - Financial capacity
    - Chemistry
    - Math/engineering
    - Competing priorities
- Actors:
    - Legislators
    - US government departments
    - Researchers
    - Industry
    - Professional societies