DIALOGUE

FEDERAL AUTHORITY TO ADDRESS PLASTIC POLLUTION

SUMMARY

Plastic pollution is emerging as a defining crisis of our time. The United States has set a national goal to eliminate plastic release into the environment by 2040, and is engaging in negotiations on a global plastics treaty while simultaneously developing a national strategy. A recent report published by the Environmental Law Institute (ELI) and the Monterey Bay Aquarium provides a comprehensive overview of existing legal authorities the federal government can leverage to achieve this national goal while safeguarding human health and the environment. On July 1, 2024, ELI hosted the authors of the report along with other experts to explore the plastic pollution crisis. Below, we present a transcript of that discussion, which has been edited for style, clarity, and space considerations.

Sarah Vican is Manager of ELI's Educational Programs.
Cecilia Diedrich (moderator) is a Staff Attorney at the Environmental Law Institute, and leads ELI's Plastics Program.
Margaret Spring is Chief Conservation and Science Officer at the Monterey Bay Aquarium.
Mary Ellen Ternes is a Partner at E&W Law.
James Pollack is a Senior Associate at Marten Law.

Sarah Vican: I want to introduce our moderator, Cecilia Diedrich. Cecilia is a staff attorney at the Environmental Law Institute (ELI), where she leads the Plastics Program, and a co-author of the report we will be looking at today.[1] She also represented ELI at the last round of Global Plastics Treaty negotiations and has presented on plastics in multiple venues since joining ELI in 2023.

Cecilia Diedrich: Thank you for being here with us today. ELI and the Monterey Bay Aquarium recently published a report on existing U.S. authorities to address plastic pollution. This webinar will cover aspects of the report and much more. Each of our panelists will give a presentation that will be followed by a question and answer (Q&A) session.

First, we'll hear from Margaret Spring, who will share her insight on the plastic pollution crisis and the need for domestic action. Margaret is the chief conservation and science officer at the Monterey Bay Aquarium and an ELI board member. She joined the aquarium in 2013 to oversee its many conservation and science initiatives. Among her many appointments, she chaired the congressionally mandated 2022 National Academies report "Reckoning With the U.S. Role in Global Ocean Plastic Waste,"[2] and is a co-author of the report that brings us here today. She currently represents the Monterey Bay Aquarium and the International Science Council at the Global Plastics Treaty negotiations and helped form the National Academies Roundtable on Plastics.

I will follow Margaret with a brief overview of our report and then turn the reins over to Mary Ellen Ternes and James Pollack, who will share their expertise with us on several areas of plastics and toxics regulation.

Mary Ellen is a partner at Earth & Water Law. Her practice brings more than 30 years of in-depth experience at the intersection of energy, manufacturing, air quality, hazardous waste management, infrastructure, and disaster response. A fellow and past president of the American College of Environmental Lawyers, as well as a fellow and leader within the American Institute of Chemical Engineers, she contributed to the 2022 National Academies' "Reckoning" report as well, has represented the Global Council for Science and the Environment at the Global Plastics Treaty negotiations, is the lead editor of the spring 2024 issue of the American Bar Association's *Natural Resources and Environment* entirely devoted to plastics, and serves as an expert on the National Academies Roundtable on Plastics.

James Pollack is a senior associate at Marten Law. He leads the firm's consumer products regulatory practice. He has extensive knowledge on per- and polyfluoroalkyl substance (PFAS) regulatory compliance at the federal and

1. Margaret Spring et al., ELI & Monterey Bay Aquarium, Existing U.S. Federal Authorities to Address Plastic Pollution: A Synopsis for Decision Makers (2024), https://www.eli.org/sites/default/files/files-pdf/Final_ELI%20Plastics%20Report_v3_03.20.24.pdf.

2. National Academies of Sciences, Engineering, and Medicine, Reckoning With the U.S. Role in Global Ocean Plastic Waste (2022), https://nap.nationalacademies.org/catalog/26132/reckoning-with-the-us-role-in-global-ocean-plastic-waste.

state levels. He is also the author of the recently published *PFAS Deskbook*,[3] and he has shared his expertise on PFAS and other chemical issues in numerous presentations in recent years.

I want to also say before we begin that we know the U.S. Supreme Court has been issuing major decisions, in particular overturning *Chevron*[4] in the *Loper Bright*[5] decision. Mary Ellen has incorporated some timely coverage into her presentation, and there might be other opportunities for such discussion during the Q&A portion. ELI has been following this, and we have a separate report titled "The Supreme Court, Environmental Regulation, and the Regulatory Environment."[6]

Margaret Spring: For those of you who may not be aware of plastic pollution, of which I hope there is none, I will provide an overview of what we know because we have done a number of scientific studies, and we'll go over one of those today.

Since synthetic plastic was first developed in the early 20th century, production has grown exponentially. In 1950, the world produced just two million metric tons of plastic per year. In 2019, annual global use reached 460 million metric tons, and that amount is expected to nearly triple by 2060. Every year, it's estimated that 19 to 23 million metric tons of this plastic leaks into the aquatic environment alone, including lakes, rivers, and our ocean, hence the interest of the Monterey Bay Aquarium in this topic.[7]

Today, the petroleum and varied chemical composition of most plastics as well as plastic waste is causing detrimental impacts to the climate, the environment, wildlife and ecosystems, and human health. In short, along with use and production, plastic pollution and its negative impacts have grown exponentially. Whole and broken-down plastics are readily seen in our streets and in our waterways. But they have also permeated the deepest parts of our ocean, the air above our tallest mountains, the food we eat, and our own bodies.

In support of addressing this global problem and pursuant to a congressional mandate in the bipartisan Save Our Seas 2.0 Act of 2020,[8] the National Oceanic and Atmospheric Administration sponsored the ocean studies for the National Academies of Sciences, Engineering, and Medicine to commence a report on the United States' contribution to global ocean plastic waste and to recommend potential means to reduce those contributions.

This was a first scientific synthesis. It's very important and there hasn't been another like it since. So for now, this is the state of knowledge of the U.S. role. At the close of 2021, we issued a report confirming the nation's outsized role in global plastic pollution, and recommended the United States adopt a plan of action by the end of 2022. We recommended a life-cycle intervention approach and a national strategy, a science and policy strategy, because we found that there was no comprehensive approach taken yet by the United States unlike other countries or even the states.

What does that report say? It stresses there should be a comprehensive strategy across the plastic life cycle. The diagram in Figure 1 below shows the six stages of plastic pollution where we can intervene to reduce it. Many of us have only experienced plastic pollution where we encounter it: at stages five and six, where plastic pollution is released to the environment and ocean. But really, the beginning of plastic pollution starts at stages one and two, with plastic production and the way plastics are designed.

What we found in our report was that the United States had taken action largely near the end of the pipe, at stages four, five, and six: improving waste management, capturing waste, and minimizing at-sea disposal. Very little had been done at stages one through three: reducing production, innovating design, and reducing waste and pollution in the first place. So, in order to have an effective strategy, there has to be an emphasis on action across all six stages, and emphasis particularly in what we call the upstream activities (stages one through three).

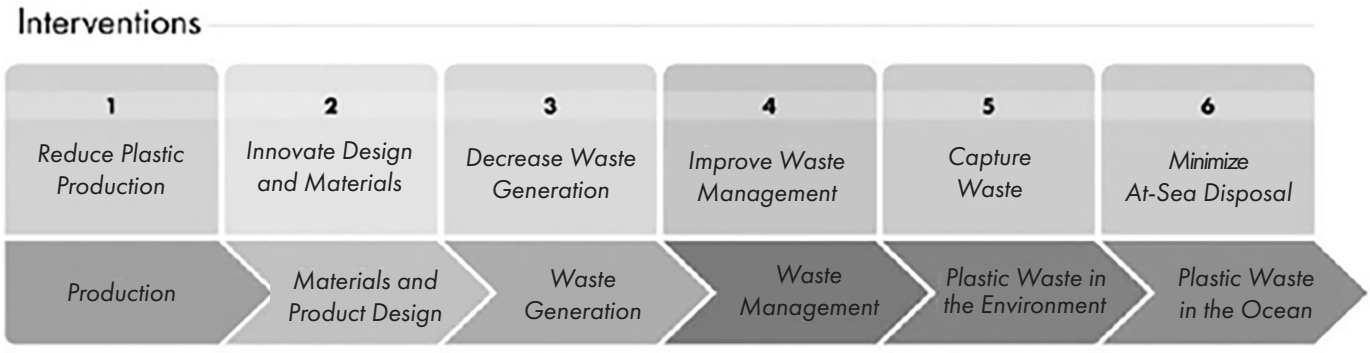
At the same time that this report was being developed by the National Academies Committee, a number of comprehensive studies were being released, also speaking about the human health impact. The National Academies report did not include a synthesis of that information as it was not in our statement of task. But some polymers and chemicals in plastics have also posed harms, and you're going to hear a bit more about that later on.

Other important reports were being released, including from a panel assembled by the United Nations Environment Programme, which was released in fall 2021.[9] The growing awareness that these reports brought to the global plastic pollution crisis and its impacts on human health and the environment increased the urgency of global action, and governments across the world began formal negotiations for a United Nations international and legally binding agreement to end plastic pollution (a Global Plastic Treaty). Following the release of our National Academies report, the United States formally joined those negotiations and is now working with nations worldwide to identify and address the problems associated with pollution both internationally and domestically.

In this report, the committee responded to the U.S. Congress' questions and laid out a state of knowledge,

3. James B. Pollack, PFAS Deskbook (ELI Press 2023), https://www.eli.org/eli-press-books/pfas-deskbook.
4. Chevron U.S.A., Inc. v. Natural Res. Def. Council, 467 U.S. 837, 14 ELR 20507 (1984).
5. Loper Bright Enters. v. Raimondo, 603 U.S. __, 54 ELR 20097 (2024).
6. ELI, The Supreme Court, Environmental Regulation, and the Regulatory Environment (2024), https://www.eli.org/sites/default/files/files-pdf/SCOTUS%202024%20Report.pdf.
7. United Nations Environment Programme, *Plastic Pollution*, https://www.unep.org/plastic-pollution (last visited Aug. 18, 2024).
8. Pub. L. No. 116-224, 134 Stat. 1072 (2022).
9. United Nations Environment Programme, From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution, https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution (2021).

Figure 1. Six Stages of Plastic Pollution



Source: National Academies of Sciences, Engineering, and Medicine, Reckoning With the U.S. Role in Global Ocean Plastic Waste 15 (2022), https://doi.org/10.17226/26132.

information needs, and the gaps to be filled. In doing so, we also reviewed what authorities or "tools" the United States has in its arsenal to take further action in line with the report recommendations. Appendix C of the report, "Legal Framework,"[10] which I'm afraid nobody read, tried to lay out where our existing legal authorities and activities were and tried to piece this together.

The reason Monterey Bay Aquarium teamed up with ELI to develop the report on existing U.S. plastic authorities was to work from that appendix and start fleshing these authorities out further. We grounded our report in the National Academies consensus report because it was the most comprehensive synthesis to date of the challenges facing the United States, and to start looking more deeply into what the legal authorities might be to support U.S. action.

Our report was particularly geared to identify the pathways the United States can take to meet its stated goal both domestically and in the Global Plastics Treaty to "eliminate the release of plastic waste into the environment by 2040,"[11] and "to support protection of human health and the environment."[12] Those are the two very dynamic statements of ambition for the United States, and we thought that this would be an important contribution.

The report is intended to be a useful tool in the process of shaping a U.S. whole-of-government approach to address plastic pollution, including legislation and positions being developed on Capitol Hill, and to inform stakeholder understanding of the potential regulatory landscape. Specific policies and priorities are being established by individual agencies such as the U.S. Environmental Protection Agency (EPA), which issued its "Draft National Strategy to Prevent Plastic Pollution" in 2023.[13] In addition, there are interagency policy committee discussions around how to establish a U.S. domestic science and policy strategy as called for by the National Academies, which is influencing an evolution of the U.S. position at the Global Plastics Treaty.

Our report really covers the federal domain. Outside of the federal domain, we see corporate reputational, fiscal, and liability risks, as well as state and local policies and lawsuits that are actively shaping the landscape and may accelerate pressure toward clearer national and global rules and requirements. We don't cover that in this report, but I want to flag that federal action is only one piece of the bigger puzzle, and we're seeing daily new challenges to the way we're addressing plastic pollution.

What's in this report that Cecilia is going to lay out? It's the existing U.S. federal authorities across each of the six "intervention" areas. We also have it organized in such a way that you can look at an agency's authorities. So, if you're just interested in what EPA can do, or what the U.S. Food and Drug Administration (FDA) can do, we laid that out there. If you're interested in what all the agencies can do together under each intervention area, that's displayed as well. It's intended to show pathways, to help people get their minds around what we see as a massive, unaddressed problem.

Our report also recognizes the actions of the federal government as of the date of publication (March 2024), which includes the creation of the Interagency Policy Committee on Plastic Pollution and a Circular Economy within the Council on Environmental Quality (CEQ) at the White House, and many environmental justice and sustainability Executive Orders.[14] I mentioned the draft national strategy from EPA, and there are a number of rulemakings for the agency actions that were underway either previewed or already issued.[15]

10. National Academies of Sciences, Engineering, and Medicine, *supra* note 2, app. C, https://nap.nationalacademies.org/read/26132/chapter/14.
11. Spring et al., *supra* note 1, at 3.
12. *Id.* at 29.
13. U.S. EPA, Draft National Strategy to Prevent Plastic Pollution (2023), https://www.epa.gov/circulareconomy/draft-national-strategy-prevent-plastic-pollution.
14. Exec. Order No. 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All (Apr. 21, 2023); Exec. Order No. 14091, Further Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (Feb. 16, 2023); Exec. Order No. 14081, Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy (Sept. 12, 2022); Exec. Order. No. 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability (Dec. 8, 2021); Exec. Order No. 14008, Tackling the Climate Crisis at Home and Abroad (Jan. 27, 2021); Exec. Order. No. 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (Jan. 20, 2021).
15. Department of Defense, General Services Administration, and National Aeronautics and Space Administration, Federal Acquisition Regulation: Sustainable Procurement, 89 Fed. Reg. 30212 (Apr. 22, 2024).

So, while this report is comprehensive, it's not exhaustive, because there's a lot of information that we would love to incorporate into a second version. Also, the report doesn't identify timelines for federal action. This is intended to be a guide; it doesn't, as I said, evaluate state action because that was beyond our scope. What I would like to say to this large group is that feedback on this report is welcome.

Cecilia Diedrich: As Margaret summarized the National Academies report, she said no one read Appendix C—but we read it a lot. Building upon that, it was really important to develop this base layer of trying to identify what tools the U.S. government had at its disposal to start to address plastic pollution. We viewed this report as step one.

But as Margaret said, there are lots of opportunities for further development of regulations, and new legislation on the table. It is continually being developed. States are taking action. There is litigation underway. There's a lot happening in this space, not to mention all of the evolving scientific information and monitoring improvements. It's a complicated area. This report is robust, but we're trying to make it as user-friendly as possible, making it easy to look at bits and pieces of it as they are relevant to you and what you're most interested in.

Interventions can be applied throughout the life cycle of plastics. Again, the scope and complexity of this problem, and the interventions and strategies in this space, go well beyond what we proposed here and what the National Academies report identified. So, there will be opportunities to go beyond this and build upon these themes. But talking about plastic pollution in this way and about solutions is important for continuity both within the U.S. government approach and with the Global Plastics Treaty approach to this problem.

What we're calling "intervention one," the first intervention area—as Margaret said, there are areas where there needs to be more focus in these spaces earlier on in the plastic life cycle—is regulation of production and associated pollution, and then restriction of problematic and unnecessary polymers and chemicals of concern, which is an important component to all of this.

As of now, a lot of the authorities that we identified are relevant to emissions from the production process and do not necessarily go to the actual regulation of plastic production on the front-end—though there are plenty of opportunities to do that. I'll go over a couple of them.

The Clean Air Act (CAA)[16] is an incredibly interesting opportunity to regulate in this space, as are the Toxic Substances Control Act (TSCA)[17] and the Clean Water Act (CWA).[18] Focusing more on the facility side, there is also the National Environmental Policy Act (NEPA).[19] Mary Ellen is an expert in the CAA and the CWA, and James can speak to TSCA a bit more.

Next, early on in the production stages is also the innovation of material and product design to enforceable product standards, voluntary commitments, and standards for labeling and marketing. A lot of this gets to the voluntary actions that can be taken and/or existing regulations about the products themselves. There is also a lot of opportunity for research and development (R&D) in this space.

Then, we move on to decreased waste generation through product bans, mandatory procurement rules, and extended producer responsibility. Again, TSCA can play into this space. But there are also executive orders that are relevant to this; especially as the government is such a large purchaser, implementing procurement practices that reduce demand in this space is really important.

We look at improvement of waste management through disposal, collection, and recycling improvements, as well as water treatment improvements, and monitoring and data collection requirements. The Resource Conservation and Recovery Act (RCRA)[20] is an important element in this space, as well as the CWA. There are specific programs that could be or are already doing work in this space and/or could be expanded to address plastics more specifically.

The capturing of waste by removing plastic from waterways, wildlife habitats, and hot spots is a really broad category. But again, we're getting to the back-end of how to regulate plastics within the life cycle. This is where the CWA comes into play. And then, there are marine-specific statutes through which we can achieve direct removal of debris from the sea, as well as using our technological resources. The National Aeronautics and Space Administration has some really interesting satellite technology for hot-spotting. Using anything and everything at our disposal to try to remove the plastic waste that is removable from our environment at this point in time is incredibly important.

Looking at minimizing at-sea disposal, again, before even capturing waste, we need to figure out ways to minimize the actual pollution on the front-end. We have authorities under a lot of our marine statutes to be able to regulate this and really do more enforcing on this end. This is an interesting and exciting space where further development could be beneficial.

Then, we added a final space, which was somewhat incorporated into the National Academies report, as an additional intervention space, where information and data collection, R&D, and outreach and education will be pivotal to supporting all of the strategies under the specific intervention areas. So, utilizing the United States' robust resources in this space is incredibly important and something that the government has a lot of authority to move on.

The main takeaways from our report include that the federal government has the authority to start to address plastic pollution at every single stage of the life cycle. Increased funding and legislative support could help support faster and more robust action. And, as I was just say-

16. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618.
17. 15 U.S.C. §§2601-2692, ELR Stat. TSCA §§2-412.
18. 33 U.S.C. §§1251-1387, ELR Stat. FWPCA §§101-607.
19. 42 U.S.C. §§4321-4370h, ELR Stat. NEPA §§2-209.
20. 42 U.S.C. §§6901-6992k, ELR Stat. RCRA §§1001-11011.

ing, information and data collection are imperative to us being able to move forward on all of these.

Mary Ellen Ternes: Why are we here? After I graduated from college in 1984, I began working for EPA in the Superfund program as an on-scene coordinator (OSC). The OSCs are the ones who go out to situations like the East Palestine train derailment,[21] and they're commanders on the scene. They have to deal with the chemicals there. In remediating many different sites and working within the Superfund program, it became very clear to me that we developed our analytical techniques and our risk assessment and our categorization in different ways based upon a set of industry products and byproducts that were generated during the 1960s and 1970s.

When we first came up with these statutes that we adopted to protect our air and our water with media-specific protection from industrial pollutants, we focused on acute risks from ignitable, corrosive, reactive, and toxic solid wastes. And we implemented them relying on this known chemical inventory developing, again, these responsive techniques that were designed to support the implementation of the statutes at the time.

If you take a look at the Emergency Planning and Community Right-to-Know Act (EPCRA)[22] List of Lists,[23] it's very interesting to see exactly how all the pollutants fit within all the different statutes. They are regulated in each media.

But many pollutants didn't fit our perception of risk at the time—for example, persistent chemicals like PFAS. And we've been playing catch up. Plastic didn't fit either due to its relatively inert nature. You can see by design it's intended to be perpetual in existence. We designed it and manufactured it to be tough. And so because it is inert, it is a solid waste, not a hazardous waste.

Yet, as we know now, it is this same feature, this feature of its inert nature, that causes it to be persistent—so persistent that it never actually breaks down. At least not in a meaningful way for our purposes it does not degrade. It microfractures into tiny, little microparticles that can bioaccumulate and pose other unique risks that we haven't completely characterized and integrated into U.S. environmental policy.

So, we have plastic and its degradation products, micro- and nanoplastic pollution, which is the inevitable result of unrestrained production, use, waste management, and leakage in the environment, which each poses its own unique risks. We've got plastic particle exposure, bioaccumulation, biological interference from particles, ingestion, inhalation, and dermal absorption.

We also have chemical exposure to plastic additives, and chemicals adsorbed by plastic from the environment or in the manufacturing process. These chemicals that are either added intentionally, unintentionally, or adsorbed onto the surface are released from the plastic particle surface at increasing rates with decreasing particle size.

The smaller it is, the faster the rate of release because more of the volume is exposed to the environment on the plastic particle surface. The faster it's released to the environment and into organisms, the more particles act as chemical delivery devices through inhalation, ingestion, and absorption. Another feature that we have to recognize is that this plastic is something that microorganisms love. So, there is also the risk of pathogenic exposure—the microorganisms thrive on plastic surfaces, including microplastic and nanoplastic surfaces.

One of the questions I typically get is, how are we just now thinking about these microplastic particles as a threat? How come we didn't ever pick up on this? If you look at the initial risk assessments done years ago, the risk assessments on microplastics were done using microspheres, the kind that were added to personal care products. And microspheres don't have the same features as some of these micro-fractured secondary particles. They tend to roll right out of the biological organism, and at the size tested, the microplastic particles we find in the environment are not represented by these microspheres that were tested earlier.

The types of smaller and smaller problematic, sharp-ended shards and curly fibers are not just eliminated, and they can bioaccumulate and have been shown to interfere with biological processes. We haven't been looking for these particles until recently. Our environmental sampling, our analytical techniques, were historically developed just for the perception of hazard that we grew up with. Now we are developing new methods to try to characterize these particles, and the chemical risks and the particle risks.

As an example of a few statutory opportunities, the Occupational Safety and Health Act has the "General Duty Clause" whereby each employer shall furnish to each of its employees both employment and a place of employment free from recognized hazards.[24] So, specific standards. The Occupational Safety and Health Administration (OSHA) does have rules for particles—carbon nanotubes, fiber, silica, asbestos, and talc. OSHA has recognized isocyanate exposure during manufacture of some plastic products.

And then, the National Institute for Occupational Safety and Health (NIOSH) Nanotechnology Research Center is studying exposure from releases of airborne nanoplastics and microplastics, particularly thermal degradation products of polytetrafluorethylene alone that can result in polymer fume fever and potentially fatal

21. *See* 40 C.F.R. §300.120; Memorandum from Ralph Dollhopf, On-Scene Coordinator, Emergency Response Section 1, to Douglas Ballotti, Director, Superfund & Emergency Management Division (Feb. 21, 2023), https://www.epa.gov/system/files/documents/2023-03/Action%20Memo%20%28REDACTED%29%20-%20East%20Palestine%20Derailment%20ER%20-%2020230221.pdf.
22. 42 U.S.C. §§11001-11050, ELR Stat. EPCRA §§301-330.
23. List of Lists: Consolidated List of Chemical Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and Section 112(r) of the Clean Air Act (CAA) (2024) (EPA 550-B-24-001), https://www.epa.gov/system/files/documents/2024-05/epcra-cercla-caa-112r-consolidated-list-of-lists-updated-may-2024_0.pdf.
24. 29 U.S.C. §654(a)(1).

pulmonary edema.[25] NIOSH is looking at government approaches to measure, assess, and mitigate nanoplastic and microplastic exposure in the workplace and recommends voluntary control measures.

Therefore, we understand OSHA and NIOSH are in the process. We know that we have standards. And the point about particulate matter, which we're going to get into in a moment with the CAA, is that we have been regulating particles primarily under the environmental statutes as a mass-per-volume basis or milligrams per cubic meter.

I'm going to mention asbestos for a moment. The permissible exposure limit standard for an eight-hour period for asbestos particulate size 0.1 to 10 microns, which is 100 to 10,000 nanometers, is 0.1 fiber per cubic centimeter. So, given what we're seeing with the microparticle and nanoparticle research with NIOSH, we may end up with a similar count per unit volume limit for microplastic exposure. We don't know yet. But some scientists have expressed concern when referencing asbestos along with microplastic. Asbestos has a smoking gun of mesothelioma, which we don't have yet for nanoplastic and microplastic.

Historically, our social experiment with microplastic posing both particle and chemical risks might in some cases be more like asbestos wrapped up in PFAS than the early microsphere research because they are quite different. The microproducts we have now, saturated in chemicals, are quite different from the research limited to that simple microsphere stuff.

Consider the asbestos timeline. We began making ships for the war effort in the 1920s and 1930s, using asbestos insulation, asbestos in manufacture and production of the ships. Asbestos was a great flame retardant. We began making everything out of asbestos, from insulation to cigarette filters and Christmas tree flocking to the snow in the *Wizard of Oz*. But then, in 1964, the *Journal of the American Medical Association* published its research, "Asbestos Exposure and Neoplasia," associating shipbuilders' exposure with fatalities and incidence of disease, including mesothelioma.[26] That's about 30 to 40 years between the significant exposure and the broad recognition of harm.

Consider also the PFAS timeline. James can talk about PFAS. But the PFAS timeline is also interesting. Commercial production of PFAS began in the 1950s, and really took off in the 1970s, until Rob Bilott filed suit against DuPont in 1999 based on the evidence demonstrating the harm,[27] and 20 years later, we're finally regulating it.

We have anticipated the period of time between the recognition of harm and the point in time when we're going to regulate it. Litigation often collapses that time frame. What we see with PFAS, what we saw with asbestos, is litigation immediately after recognition/demonstration following sufficiently clear, demonstrative evidence of harm. And I think that we're starting to see litigation with plastic.

But from the 1960s—when plastic was a new market—to now, when exposure to plastic is unavoidable in our daily lives, we have to ask: Are we the shipbuilders of today in our own living rooms? That's the question. We don't know. But exposure in our homes has been shown to be higher than exposure outside. Every week, we see new data published that establish the presence of microplastic and nanoplastic everywhere on the planet. As Margaret said, it's everywhere—in our food, our water, our agricultural fields, our consumer products, and our bodies—and there are suggested associations with blood clots, cardiovascular disease, plaque formation, pulmonary inflammation, infertility, dementia, congenital malformation, and more.[28] So, we don't know. It's a grand social experiment.

The CAA regulates particulate matter sources. EPA considers fine particulate matter ($PM_{2.5}$) in its implementation. The Agency has a list of sources, and I did review the list that it considers in evaluating particulate matter to weigh its risks—microplastic isn't included. It's not counted in the $PM_{2.5}$ measurement. The $PM_{2.5}$ ambient air quality standard is a mass-per-unit basis. There is a 24-hour and an annual standard. But these filters capture the mass of $PM_{2.5}$ that is drawn into the high-volume sampler, and that filter is simply weighed.

So, the particles aren't counted, and the smallest particle is about 1 micron. That's 1,000 nanometers. It's not speciated and the limit is not as low as you think, 1 to 2.5 microns. EPA is looking at $PM_{2.5}$ and at microplastic and nanoplastic.

What I can say now is that we have known sources of nanoplastic and microplastic emissions. For example, municipal waste incinerators burn plastic. They're allowed to emit $PM_{2.5}$ at a rate of 25 milligrams per cubic meter, and up to 100 tons per year or more is permitted without speciating for microplastic. That is in stack emissions, fugitive emissions, and ash content of the wastewater discharges, and there is no plastic destruction efficiency required to be demonstrated.

Fugitive-level emissions being not from a stack but just from the crushing of plastic in a solid waste management plastic recycling facility is also, to my knowledge, not regulated in terms of microplastic and nanoplastic particles. Microplastic fibers that preferentially concentrate in wastewater treatment plant sludge are then land-applied as biosolids,[29] only to be released as fugitive ground-level emissions through wind erosion. That's not permitted or tracked.

25. Vladimir Murashov et al., *Nano- and Microplastics in the Workplace*, 18 J. Occup. & Env't Hygiene 489 (2021), https://www.tandfonline.com/doi/full/10.1080/15459624.2021.1976413#d1e135.
26. Irving J. Selikoff et al., *Asbestos Exposure and Neoplasia*, 188 JAMA 22 (1964).
27. Rob Billot & Tom Shroder, Exposure: Poisoned Water, Corporate Greed, and One Lawyer's Twenty-Year Battle Against DuPont (Atria Books 2019).
28. *See, e.g.*, Douglas Main, *Microplastics Are Infiltrating Brain Tissue, Studies Show: "There's Nowhere Left Untouched"*, Guardian (Aug. 21, 2024), https://www.theguardian.com/environment/article/2024/aug/21/microplastics-brain-pollution-health; *see also* Tingting Wang et al., *Multimodal Detection and Analysis of Microplastics in Human Thrombi From Multiple Anatomically Distinct Sites*, 103 eBioMedicine 105118 (2024), https://doi.org/10.1016/j.ebiom.2024.105118.
29. Xiaowei Li et al., *Aging and Mitigation of Microplastics During Sewage Sludge Treatments: An Overview*, 922 Sci. Total Env't 171338 (2024), https://www.sciencedirect.com/science/article/abs/pii/S0048969724014773.

Then, of course, there's tire wear particles. The CAA regulates tailpipe emissions, not tire wear particles. And the mitigation measures have to do with fuel efficiency standards, not tire wear particles. That's important because heavier cars create more tire wear, and electric cars are heavier.

We haven't designed our waste management systems to deal with plastic. As a former RCRA hazardous waste incinerator permit writer, I was a compliance officer for a commercial hazardous waste incineration company. I worked to permit and demonstrate complete destruction of hazardous waste to the 99.9999% destruction and removal efficiency (DRE) standards, "six 9s" DRE, working along with the chemical engineers designing, permitting, and patenting these units. We designed and operated the units to specifically destroy the waste fed to them. Whether it was polychlorinated biphenyls, dioxin wastes, or, as in my later legal work, chemical weapons.

We haven't designed municipal waste incinerators to completely destroy plastic. We don't have permit requirements that impose operating restrictions that would improve the destruction of plastic. We don't test for remaining microplastic in air emissions, water discharge, or ash. We ignore ground-level fugitive emissions from waste management and deposition, just like we ignore it from tire wear particles.

I think EPA has discretion to regulate microplastic. If you recall *Chevron* deference and the *Loper Bright* decision, *Chevron*[30] was the CAA case. It was about how EPA was going to interpret and implement the term "source"—whether it's a plantwide definition or a bubble concept—and how emissions would be counted for the term. It wasn't spelled out. The statute was silent. This was where *Chevron* came from, where the statute was silent and doesn't contemplate separating out different sources within a plant site for CAA regulatory purposes. Well, judges aren't experts in the field. The Court decided that EPA was entitled to deference.

But if you think about *Chevron* later, in *Massachusetts v. Environmental Protection Agency*,[31] the Court chose not to defer pursuant to *Chevron*. The Court decided that the CAA's broad and unambiguous definition of "air pollutant" had to include greenhouse gases. Because the definition said "any air pollution agent or combination of agents, including any physical, chemical, biological, radioactive . . . substance or matter which is emitted into or otherwise enters the ambient air."[32] Well, that's pretty clear. It's anything that's emitted into the air.

And with *Loper Bright*, I think "air pollutant" is pretty clear. "Particulate matter" is pretty clear. The one thing that we struggle with, of course, is the method by which we would measure it. But I think there is an opportunity for EPA to regulate microplastic and nanoplastic under the ambient air quality standards, or as a hazardous air pollutant.

In his dissent in *Massachusetts v. Environmental Protection Agency*, Justice Antonin Scalia said, "*[E]verything* airborne, from Frisbees to flatulence, qualifies as an 'air pollutant.'"[33] I note here, Frisbees are in fact made of plastic. The courts already said the definition of "air pollutant" is clear. So, there you go. I think it regulates microplastic. I think EPA has the authority absent *Chevron* to go ahead and regulate it as either microfiber or particulate matter.

Another possible opportunity would be under the Solid Waste Disposal Act (SWDA), which is amended by the RCRA amendments. But the original, prior to RCRA, still included text on open dumping and plastic hot spots. It included an open dumping prohibition. An open dump is any facility or site where solid waste is disposed of, which is not a sanitary landfill, which meets this criteria under the statute. Open dumps are prohibited.

Many, many years ago, in the beginning of the regulatory programs, states were delegated the authority to implement these provisions of the SWDA. EPA said, look, you've all got open dumps. We need to update this and go from "open dump" to "sanitary landfill," and finally to "municipal solid waste landfill."

But EPA has always maintained that open dumps are prohibited, that states are required to list them under solid waste management plans, and then clean them up. You think, well, EPA, you know that happened one time only. No. EPA still raised this in its 2015 coal ash regulation, saying that new open dumps are prohibited.[34]

Now, regarding remediation of these open dumps or plastic hot spots, they're all over the country. We've seen them in New York with Attorney General Letitia James' case, *People of the State of New York v. PepsiCo, Inc.*, filed November 15, 2023.[35] It details how the attorney general's office sorted the trash collected along the Buffalo River and identified PepsiCo and Frito-Lay as the sources of the majority of the trash, and it seeks not just cost remediation but also disgorgement of profits. Then, on June 20, 2024, Baltimore filed against PepsiCo, Frito-Lay, Coca-Cola, and plastic manufacturing companies to recover costs of their plastic waste management.[36]

This is ongoing. EPA doesn't need to create new authority prohibiting open dumping; it is prohibited in the states. And it looks like cities are actually taking action to recover their costs to manage them. But I think this is something

30. Chevron U.S.A., Inc. v. Natural Res. Def. Council, 467 U.S. 837, 14 ELR 20507 (1984).
31. 549 U.S. 497, 37 ELR 20075 (2007).
32. 42 U.S.C. §7602(g).
33. *Massachusetts v. Environmental Prot. Agency*, 549 U.S. 497 n.2.
34. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities, 80 Fed. Reg. 21302 (Apr. 17, 2015).
35. Complaint, People of the State of New York v. PepsiCo, Inc., No. ___ (N.Y. 8th Jud. Dist. filed Nov. 15, 2023), https://www.eli.org/sites/default/files/files-general/PepsiCo%20Complaint%20-%20New%20York%20State%20Attorney%20General.pdf.
36. Press Release, Mayor Brandon M. Scott, City of Baltimore Announces Lawsuit Filed Against Plastic Manufacturing Companies for Role in Pollution (June 20, 2024), https://mayor.baltimorecity.gov/news/press-releases/2024-06-20-city-baltimore-announces-lawsuit-filed-against-plastic-manufacturing.

EPA could enforce, and it's something the states and cities could enforce.

Take a look at the Plastics Litigation Tracker Center to monitor litigation,[37] and look at the Center for International Environmental Law report released last week on making polluters pay cities and states to recoup the rising cost of plastic pollution, discussing various legal strategies.[38]

Margaret is the co-author on the Minderoo-Monaco Commission Report,[39] and I think it was really helpful in pulling everything together. I encourage you to take a step back and think about plastic on our planet now where our planet is saturated, considering the entire, say, life cycle of plastic (by which I mean existence). Every time I say "life cycle," people tend to think that once you dispose of it, it's no longer in its "life cycle." Plastic doesn't die. It fractures and becomes more problematic. But it doesn't die.

We need to consider the entire cycle of plastic production, product use, post-use plastic, and microplastic fate and transport, and its failure to meaningfully degrade in the context of U.S. environmental law as both a particle and chemical. Consider the data showing that plastic is now everywhere on the planet and everywhere in us.[40] We're saturated with plastic. Consider the study that was released in *Science Advances* on April 24, "Global Producer Responsibility for Plastic Pollution," basically finding that for every kilogram of plastic produced, it results in a kilogram of pollution.[41] We are so saturated. It has nowhere to go.

The challenge of plastic as a pollutant is that its risks are both particle and chemical, as well as other properties. We have yet to characterize the electrochemical and physicochemical properties. And the particles, physicochemical and other properties, vary as much as the polymers and chemicals used in manufacturing, and the sizes and shapes resulting from continued fracturing during use, post-use management, environmental fate, and transport. It can seem overwhelming. People say how in the world can we figure out the risks? Well, we've done it in the past. We have prioritized and figured it out.

Apparently, microspheres are not a problem. We have other shapes and sizes that are much more problematic. We can prioritize an aggregate risk for regulatory purposes as we have in the past for a group of pollutants, for example. We calculate dioxin risks, not for each molecule, but we boil it down to the equivalent of 2,3,7,8-tetrachlorodibenzo(p) dioxin (TCDD) because that's the most toxic form of dioxin, we say. So, for example, the dioxin risk for a site is X number TCDD equivalents. We can do this. We can prioritize and figure out what's the problem, and we can figure out a strategy to deal with what seems to be the most problematic and prioritize that way.

In mitigating microplastic and nanoplastic pollution, there are new tools. If we cannot just read the label like New York is doing and Baltimore is doing, where they pick up the trash and read the label, forensic experts with more than 50 years of Superfund litigation experience fingerprinting groundwater plume data are eager to fingerprint both the microplastic particles and their unique and proprietary chemical additives to identify the source with developing analytical and evidentiary approaches.

Look at particles—recall we discussed how particles have been regulated as mass, based on filter catch. Not by particle count or characteristics of the particle, like asbestos is regulated by particle count. But we are developing new techniques. The Environmental Council of the States and the Interstate Technology and Regulatory Council (ITRC) of the Environmental Research Institute of the States has a microplastic project.[42] With that, the states are cataloguing the microplastic sampling analytical method.

Take a look at the new methods for microplastic monitoring, particularly the ITRC's discussion regarding microplastic fate and transport from biosolids application.[43] It's very interesting. And then, look at the Proceedings of the National Academy of Sciences (PNAS) research from January 8, 2024,[44] which is also interesting. We learned that we don't just have 400 microplastic particles in one bottle of water, we have about 400,000—(2.4 + 1.3 x 105) in each liter, about 90% of which are nanoparticles. The researchers used a new hyperspectral Stimulated Raman scattering imaging platform with an automated plastic identification algorithm that allows microparticle and nanoparticle analysis at the single particle level, with high chemical specificity and treatment measuring below 100 nanometers. That's amazing. So now, it looks like we have some new technology for the particles.

Then, on the chemical side, we've seen how chemical identification has been difficult with 16,000 different unique proprietary additives. We're working with that. But they are marketed that way. They're not that different. Just as an example, they fall into families. So, there may be 2,700 phenolic antioxidants in the market, but many reflect a basic functional chemical structure, repeated throughout. It's not as complex as it appears. And we believe 16,000 would be greatly simplified for regulatory purposes.

37. Plastics Litigation Tracker, *Home Page*, https://plasticslitigationtracker.org/ (last updated July 2, 2024).
38. Steven Feit et al., Center for International Environmental Law, Making Plastic Polluters Pay: How Cities and States Can Recoup the Costs of Plastic Pollution (2024), https://www.ciel.org/wp-content/uploads/2024/06/make_polluters_pay_cities_states_recoup_costs_plastic_pollution_report.pdf.
39. Philip J. Landrigan et al., *The Minderoo-Monaco Commission on Plastics and Human Health*, 89 Annals of Glob. Health 23 (2023).
40. United Nations Environment Programme, *supra* note 8. *See, e.g.*, Katharine Gammon, *There's Even Plastic in Clouds*, Nautilus (Jan. 12, 2024), https://nautil.us/theres-even-plastic-in-clouds-489634/.
41. Win Cowger et al., *Global Producer Responsibility for Plastic Pollution*, 10 Sci. Advances eadj8275 (2024), https://www.science.org/doi/10.1126/sciadv.adj8275.
42. ITRC, *Microplastics*, https://mp-1.itrcweb.org/ (last updated February 2023).
43. *See* ITRC, *Environmental Distribution, Fate, and Transport*, https://mp-1.itrcweb.org/environmental-distribution-fate-and-transport/ (last visited Sept. 9, 2024).
44. Naixin Qian et al., *Rapid Single-Particle Chemical Imaging of Nanoplastics by SRS Microscopy*, 121 PNAS e2300582121 (2024), https://doi.org/10.1073/pnas.2300582121.

The tough part about chemical analysis, though, is that generally—and if you've been doing environmental work for a while, you understand—you always need to know what you'd expect to find and analyze for that. Not just sample something and then determine what in the world is in there. It's not like asking a question. You need to know what you're analyzing for.

But now, it looks like we have a new technology that utilizes artificial intelligence and computer algorithms to develop a completely identified spectrograph of the chemicals that are analyzed by the machine so that it's not so much guesswork. You can have the computer figure out what the peaks are and isolate them. Advances like this will assist in fingerprinting unique chemical additives associated with microplastic pollution in the environment to identify the source, if you can't read the label.

Lastly, as a segue to James Pollack, with all the PFAS risk assessment, regulation, and mitigation, it is important to note that PFAS may be part of or may constitute itself microplastic—fluoropolymers, for example—such that microplastic may be mitigated with the PFAS mitigation, and that PFAS removed through these measures may also be or may contain microplastic. And the risks of these together, PFAS *and* microplastic, might be magnified.

If we have PFAS on secondary microplastics, what we find is that in the environment, PFAS adsorbs. It clings to the surface of these secondary microplastics. Microplastics play a role as carriers of harmful chemicals absorbed into our bloodstream, and then it delivers that dose of PFAS and other chemicals into our bodies, where otherwise it might be eliminated. It's left with the microparticle that's in our bodies. And nanoplastics, we don't have to actually inhale or eat them. They actually can be absorbed through our skin.

James Pollack: My role here is to talk about PFAS—the way that different regulators have been targeting PFAS and lessons that we can learn from the PFAS experience thus far in understanding what an approach to plastics might look like going forward.

To start us off, I know this isn't explicitly branded as a discussion about PFAS, so I'm going to try not to assume too much knowledge. But I will say that this is a pretty popular topic right now, so I wouldn't be surprised if folks are at least somewhat familiar with PFAS. They are synthetic, meaning human-made. They are highly mobile and persistent chemicals; as Mary Ellen referred to these synergies or these similarities with plastics, they are pretty obvious on their face.

What's also interesting about them is they're defined as a family of chemicals, and depending on the definitions that you use, you'll get a very different set of counts for PFAS. You might hear estimates of more than 1,000 chemicals that are in the economy. You might see 9,000 chemicals based on one definition. You might see 13,000 chemicals or 15,000 chemicals based on yet another.

The reason for these different estimates is the use of different definitions. These definitions really matter for what is encompassed within the family of chemicals. There is actually a standards committee set up by ASTM International to look at the regulation of PFAS in consumer products that for the past two years now has only been discussing the definition of PFAS. So, you can see the definition really does make a difference here.

There are general categories, especially if you look historically at PFAS, including C8 or long-chain, referring to the carbon backbone of the structure, or a shorter chain like C6 or C4 or even smaller, as well as polymers. You can use PFAS to construct polymers, membranes, and things like that that have all kinds of consumer and industrial applications. There are really valuable qualities to PFAS, including oil, stain, grease, and water repellency, simultaneously, which is a pretty unique feature of these chemicals. They're nonreactive and stable. They decrease friction and increase heat resistance and durability. And as a result, we see them used in a number of different places both for consumers as well as in industry. You'll see them used as surfactants, used as grease, used for surfaces, used for heating. There are any number of potential uses, including rain jackets.

There is a chart that shows the number of peer-reviewed articles per PFAS chemical.[45] There are clusters of research focused on particular chemicals. This is a theme that I'll come back to. It's interesting the way that science progresses, especially in those exposure studies, or understanding the effects of chemicals on people or mice or any number of organisms. You focus in on a chemical, and you can only focus in on one or a few chemicals at a time if you're trying to disentangle their effects.

A lot of research has been done on historical PFAS like perfluorooctanesulfonic acid (PFOS) or perfluorooctanoic acid (PFOA). Then, for some of the newer PFAS or PFAS that are shorter chain, there is less research. That has implications in the regulatory sphere.

With PFAS in the environment, our understanding continues to grow on a weekly basis. But those same chemical properties of PFAS that make it so useful in industrial and consumer-product applications also help it spread and accumulate. It moves through the environment, and it can bioaccumulate in exactly the same ways that we've been discussing with plastics.

It's spread by water and air. Research shows several different potential human exposure pathways that we experience through our lives. Everything from drinking water to food to occupational hazards, or the use of PFAS within the workplace. There's dust, air particles, and I was even seeing research in the past week studying dermal exposure. Looking at dermal exposure, there's been research for a while now in certain applications like in a firefighting context with high heat. But we're starting to get other research on dermal application or dermal exposure pathways for humans as well. Our understanding of the effects of PFAS on humans continues to grow over time.

45. Zhanyun Wang et al., *A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?*, 51 Env't Sci. & Tech. 2508 fig.1 (2017), https://pubs.acs.org/doi/10.1021/acs.est.6b04806.

As I was asked to prepare for this with my knowledge of working in PFAS, I started to see a lot of parallels between PFAS and plastic. I wanted to bucket a few of those challenges and thoughts to provide a framework for discussion. One of the challenges here is definitions. Plastic as well as PFAS are defined by a group of chemicals with similar characteristics, similar chemistry, similar functions. But the fact of this sort of grouping or family creates challenges within our traditional environmental law frameworks.

A lot of our environmental laws are designed to focus on chemicals on a chemical-by-chemical basis as opposed to a family approach. There are caveats to that. There are interesting ways that folks can innovate the approach to chemistry. But that is something that has to be thought about. An example in the PFAS context is PFOA versus PFAS as the family. You'll see, for instance, with the Superfund designation, the designation of a subset of PFAS, not all PFAS. But even that single listing can still be useful from a broader cleanup perspective, and I'll talk a bit more about that in a minute.

There is a breadth of uses for this chemistry. For PFAS, there are consumer product applications—things ranging from ski wax to jackets to food contact surfaces, and industrial processes. As a result, PFAS waste is generated by a number of different categories. It's not something where you can focus in on one sector and say you've got your hands on the PFAS problem. It turns out it has implications far beyond any particular segment of the market.

That means you have to look at a broader set of generators of PFAS, the uses of PFAS, as well as waste containing PFAS that will implicate not only hazardous waste disposal, but also more traditional landfill disposal, which as research has shown is becoming a major source of PFAS contamination. We see exactly that same challenge with the plastic problem where plastic is used in a number of different sectors. You can't just focus on one.

We see the quick generation of scientific knowledge on fate and transport, as well as the way that different media will spread or contain the contaminant, and that development of knowledge will change the way that we think about regulating those chemistries.

We see development on testing, which can lead to new ways to ultimately regulate what we're trying to get at, and the research is showing discovery of the breadth of impact. It feels like, on a monthly basis, I see research finding PFAS in new places, ranging from the base camp of Mount Everest to polar bear brains. The impact of that research is to show the way that PFAS move through the environment so readily. It means that we have to think through new ways of regulating these chemicals.

The international scope of the problem also aligns these two families—the international component of manufacturing use and waste disposal. We can't ignore other countries when we approach this problem. Our oceans link the entire world, but our supply chains also link the entire world. So, understanding the ways that waste moves and products move is going to be essential. We've certainly seen that within the context of recycling in recent years.

Finally, there are multiple media implications. With some traditional pollutants, you might focus on groundwater or you might focus on soil or you might focus on air. But the challenge with this chemistry is that it has implications across a variety of media. When something like this can be readily taken up by biological material, it means that you have implications on fishing, deer hunting, the redevelopment of a property all the way to your industrial waste permit. The implications of this cover all of environmental law as a whole. And the multimedia impacts of these are reflected in our scientific findings, what I was discussing earlier.

We've seen a lot of activity on PFAS. At the federal level, we have seen a number of different environmental laws being applied to PFAS. Something that's really useful as a guide is the Joseph Biden Administration's PFAS Strategic Roadmap.[46] This road map has been updated several times. It's worth taking a look at because it actually sets out the "whole-of-government" approach to PFAS. This isn't just going to be a targeted focus of EPA alone or one agency taking on this chemistry. It's actually going to be the whole of government. How do we think through each of these different laws and how they interact with this chemistry?

We see the traditional environmental laws being utilized to regulate PFAS at the production stage, so chemical production and use regulations in the form of TSCA. Premanufacture notice is a critical form of regulation that's been utilized by several administrations to target especially legacy PFAS, the use and potential reintroduction of those PFAS into the economy. We have seen reporting regulations, requirements to report PFAS, whether in products or articles, and that's TSCA.

Congress actually adopted a new reporting framework under TSCA requiring reporting of the use of PFAS in articles imported into the United States between 2011 and 2022.[47] It's going to create an entirely rich data set of the uses and types of PFAS across the economy.

But similar reporting regulations have also been adopted under the Safe Drinking Water Act (SDWA),[48] which has collected the most comprehensive data set of PFAS contamination in drinking water supplies we've ever had. The Third Unregulated Contaminant Monitoring Rule, as well as the Fifth Rule, focus on PFAS in our drinking water supplies and require that drinking water suppliers search for and report PFAS in drinking water.[49]

Under EPCRA, this doesn't come into a lot of folks' practices, but it requires reporting on the use of chemistry in manufacturing processes in the United States and allows

46. U.S. EPA, PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024 (2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf.
47. Toxic Substances Control Act Reporting and Recordkeeping Requirements for Perfluoroalkyl and Polyfluoroalkyl Substances, 88 Fed. Reg. 70516, 70516 (Oct. 11, 2023) (codified at 40 C.F.R. pt. 705).
48. 42 U.S.C. §§300f to 300j-26, ELR Stat. SDWA §§1401-1465.
49. *See* U.S. EPA, *Third Unregulated Contaminant Monitoring Rule*, https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule (last updated June 10, 2024); U.S. EPA, *Fifth Unregulated Contaminant Monitoring Rule*, https://www.epa.gov/dwucmr/fifth-unregulated-contaminant-monitoring-rule (last updated Aug. 1, 2024).

folks to prepare for emergency response at the local and state levels. EPCRA is now being used in a very focused way to show where PFAS is being used in manufacturing. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[50] also has its own reporting requirements, similar to EPCRA, and they largely overlap.

Then, we have the CWA, which we were talking about just before this presentation started regarding ways that discharge permits can be used to monitor discharging of PFAS into water systems. EPA has been starting to implement its general reporting or its general permits, and EPA Region 1 general permitting has really interesting information about monitoring PFAS in wastewater systems.[51] It's worth taking a look at.

We have media regulations under the CWA and the CAA and exposure prevention regulations in the form of the SDWA preventing PFAS in drinking water. There are waste and cleanup regulations under RCRA and CERCLA. And of course, with the whole-of-government approach, we have EPA work. But what about all these other agencies, like the Consumer Product Safety Commission, which has indicated an interest in potentially regulating consumer products containing PFAS? Or FDA's reconsideration of PFAS in food contact surfaces and working with industry to phase out PFAS in food contact surfaces, as well as the U.S. Department of Defense looking at the use of PFAS in its military equipment? That's just the federal side.

On the state side, we have entirely new regulations going into effect, as well as traditional forms of regulation. Things like (California's) Prop 65,[52] which provides warnings to consumers about chemical content in their products—we've seen early indications it may be used to target microplastics as well. The California Office of Environmental Health Hazard Assessment is currently taking a look at that, so we could see developments in the same way that we see developments in PFAS and developments in plastics.

We see new consumer product regulation that's going into effect, like bans on the use of PFAS as a family in certain product categories. There are reporting frameworks, requiring reporting of PFAS in these products. Also, there's incorporation of PFAS into standards for permits and disposal regulations entirely independent of the federal government's authority. As well as purchase limitations saying that fire departments can't purchase things containing PFAS, or that consumers can't purchase things containing PFAS.

These are really interesting mechanisms, and these kinds of state activities will continue whether or not the *Chevron* doctrine is a factor because states have their own regulatory authority. And when a state like California acts, it can have huge implications across the international market.

What kind of lessons can we learn from all of these efforts in the PFAS space? I've gone through a lot of them, and if you would like more detail, I recommend taking a look at the *PFAS Deskbook*,[53] which does a good job of laying out a lot of these efforts.

Data collection is a critical first step. If you can't measure it, you can't manage it. So, understanding at the production phase, the introduction-into-the-economy phase, the use phase, all the way into the disposal phase—each of those steps is an opportunity for data collection. And there are all kinds of mechanisms in place already that can be utilized to collect that data.

Identification of common indicators or proxies can be a useful tool. PFAS testing on a chemical-by-chemical basis is costly and especially difficult if you start looking at different media or uses beyond water. It's hard, for instance, to test for PFAS on a metal. Those kinds of test methods are really expensive, and not generally accepted. But if you can search for a proxy, like organic fluorine or fluorine, that gives you at least an idea of what's potentially in your sample. And similarly with plastic, if you can use proxies, if you can search for things that indicate plastic, that can be a useful indicator and a useful tool for regulators.

Existing authorities also provide a robust toolkit for regulation across the chemical's life cycle. I think we've seen creativity in the PFAS experience, and taking a look at that model shows the flexibility of this toolkit to collect data and regulate chemicals, as well as the opportunities for new laws.

Cecilia Diedrich: I want to take the opportunity to get to some questions. The first question is more general, and we've gotten this a lot regarding our report. Given the complexity of the plastic pollution problem and our existing regulatory framework, where do you see opportunities for immediate action and/or priority areas for action that the federal government can take?

Margaret Spring: The report lays out a few, and as we just heard from James and Mary Ellen, there are a lot of low-hanging fruit areas. Certainly, the PFAS example tells you that there is a pathway and there is a road map for chemical additives. However, the definition of "pollutants" under the CWA is definitely an area where more work could be done. I've seen some questions about the U.S. Army Corps of Engineers' (the Corps') Rivers and Harbors Act, and I'd say that certainly plastic pollution can likely be defined as a pollutant under the CWA subject to discharge limits (they are captured to some extent now under total suspended solids) or a fill subject to permitting or regulation under the Corps' authorities.

There are lots of ways you can use existing authorities, to your point, to address the introduction into the environment, which is a major issue we are dealing with for plastic pollution. However, there are also ways of addressing it by driving the procurement decisions of the United

50. 42 U.S.C. §§9601-9675, ELR Stat. CERCLA §§101-405.
51. U.S. EPA, *Region 1 Final Medium Wastewater Treatment Facilities General Permit for Massachusetts*, https://www.epa.gov/npdes-permits/region-1-final-medium-wastewater-treatment-facilities-general-permit-massachusetts (last updated Sept. 4, 2024).
52. Safe Drinking Water and Toxic Enforcement Act (Cal. 1986).
53. Pollack, *supra* note 3.

States toward less harmful chemical-containing products. We're waiting to see the Federal Trade Commission come out with their Green Guide. And that's an independent agency, so I'm not sure that we know exactly when that's coming out. But the guidance that will steer people's decisions is going to be very important and probably quicker than somebody's regulatory pathway.

Certainly, we're particularly concerned about the chemicals at the treaty level. Production reduction is incredibly important and all the pollutants that come from there. And also the additives and the concerns of the fenceline communities are actually being discussed and acted on to some extent in the federal government, but not fast enough, and there's a lot more to be done.

Then, we have concerns about effluent limitations. The problem is that we have not treated plastic releases or discharges to the environment—our waterways or air—as pollutants or pollution, which it is. And if you keep producing more plastics, the accumulation and volume of nanoplastics and the microplastics in the environment and in our bodies is only going to grow. So, you really have to go to the top of the chain to start to address this issue. The faster we can do it, the better.

Mary Ellen Ternes: James, I'm going to pitch this to you as well, but, after Rob Bilott filed his landmark case against DuPont, there were government study groups to actually get their arms around PFAS. We haven't done that yet, that I've seen, with microplastic. Why not?

We have methods to analyze it now. As a former EPA employee, I can say we need to study it. We need to figure it out. We need to prioritize. Until we do that, we don't really have a good answer. It seems as though we've been working at cross-purposes. We said, "Oh, too much plastic; let's recycle." Well, that's not working. And it's troubling.

One of the questions we've received is, well, doesn't this mean maybe we shouldn't be recycling plastic? You know, it's really tough. Generally, the principles were if we recycle and reuse, then we won't make as much. But it's not working out that way. And the recycling processes themselves, if they're not regulated properly, could create more pollution. They're just more manufacturing plants.

The fact is these plastic particles aren't being regulated at all. If these technologies are exported to less-developed countries, then that's a problem. It almost has a perverse incentive to shift more waste to them, and then they can't manage it properly because they just don't have the resources to do that.

So, recycling is tough. As Margaret said, putting a cap on production is what the world is talking about, but we're not good at that in the United States. What happens in the United States—and, James, you need to speak to this too, as we saw with PFAS—we tend to trail litigation. We find these hazards that aren't defined, and we rely on plaintiff attorneys to drive the regulatory hammer.

James Pollack: I would add that one opportunity for low-hanging fruit is to find where folks are focusing on this problem, and then use those opportunities creatively. I think what you're describing is that there are opportunities for plaintiffs to focus on these things, and then that builds momentum.

There are potential opportunities elsewhere as well. In packaging, there is currently a development of extended producer responsibility regulations throughout the country. It gets at, essentially, the development of packaging as a huge source of pollution that needs to be dealt with. And plastic is a huge component of that.

We're going to be seeing the development of pretty large data sets about single-use packaging inputs into our economy at the state level, across the country, as well as the setting up of producer responsibility organizations. They're going to be dealing with the recycling of that material, funding the research, funding that recycling. There are opportunities here to look at that problem and to use those opportunities to ultimately address plastic.

It's worth thinking about where work is already being done that aligns with these same efforts. Where are opportunities to comment, to activate on those issues, to build momentum ultimately at the federal level?

Cecilia Diedrich: One question that we've gotten a lot concerns the *Loper Bright* decision, and where agencies stand with the potential of not getting the deference that they've gotten in the litigation space up to this point. Mary Ellen talked about this a bit with respect to the CAA. But does anyone want to address this in the plastic space in general?

Mary Ellen Ternes: We spent a lot of hours of briefing time on *Chevron* over the past 30 years. But in the end, as we've heard discussed, judges and courts will take a look at the agency decision and determine whether they agree with it, whether it makes sense.

I know there are a lot of folks devoted to *Chevron* in their practice. I don't know at this point how it affects my perception of agency discretion and how the agencies will implement and the court support them. But I do know that it does matter who's in the White House and if the president doesn't want to regulate something, then I don't know. As we saw with President George W. Bush's Administration, the Court disagreed with the use of *Chevron*.[54] The Bush Administration did not want to regulate greenhouse gases. And the Court said, no, we think it's clear. We think you've got to at least figure out what the problem is, if there's reasonable cause to regulate it.

Margaret Spring: I think we are waiting to see how much every regulatory action depends on *Chevron* deference. Really, the use of the doctrine is linked to the clarity of legislative language. I can say (this) as someone who used to write legislation. Sometimes you're a little vague and sometimes you're very specific; nobody is perfect. Drafting

54. Massachusetts v. Environmental Prot. Agency, 549 U.S. 497, 37 ELR 20075 (2007).

is never perfect. On the other hand, there's plain meaning. I do think that there will be a working out of this issue.

It does make me a little nervous, of course, as it would anyone who used to work in the federal government, because some of these issues are quite scientifically complex, as we've discussed today. That information puts a lot more work on the agencies, on the plaintiffs, on any participant in a litigation.

The extra work part is very concerning, and it will end up, I think, creating a heavy load and causing delay, as well as a more confusing regulatory landscape than actually addressing this head-on. My sense is that federal agencies have seen this coming and are starting to not rely on *Chevron*.

To the question about whether we shared this report with the agencies—we did, and we presented it and have asked for feedback, and that invitation is open. They are very busy right now negotiating the plastic treaty, so they asked for some time. But we are definitely willing to take more information on these questions and some of the questions in the chat that go to the CEQ activity.

James Pollack: Reading proposed regulations nowadays, you don't see a lot of *Chevron* citations in those proposals. They're referring to the plain language of the statute. They're trying to ground it in the text. We'll see. I think a lot of the implications of this will be in the litigation front as well as cautiousness around things to be proposed.

But some of these laws are really capacious in the way that they're drafted. The CWA definition of "pollutant" is extremely broad.[55] It's a really long list. It's worth looking at. Pollutants, things being put into the water including even heat, are covered. It would be a tough argument to suggest that something like plastic is not covered by that kind of definition. But in other cases where things are a little less clear, maybe we'll see more cautiousness going forward.

Cecilia Diedrich: This question might have a shorter answer, and I understand that there is some confusion about the difference between microplastic regulation and chemical regulation. Is it legally possible to regulate microplastic wastes as a hazard via the CAA, CWA, or SDWA? The audience member is asking about upstream implications, I'm assuming, toward the beginning of the production side of things.

Mary Ellen Ternes: The difference between plastic and other materials is that waste is regulated pursuant to its characteristics in our historical view of waste. But plastic doesn't exhibit these characteristics. As it fractures into smaller and smaller particles, then the material is almost like a precursor. It's like tetrachloroethylene if you're looking at tetrachloroethylene risk. The smaller the particle, the more it leaches. At some point, perhaps it could leach and exceed the Toxicity Characteristic Leaching Procedure, Synthetic Precipitation Leaching Procedure, or RCRA hazard characterization if it has additives that are on the list.

We define "hazardous waste" so narrowly. It doesn't have these amazing properties that are so dangerous, like ignitability, reactivity, and corrosivity. If it's merely toxic, that's just one of the characteristics. There are two routes I can see. One is if you're managing the plastic in such a way as to knowingly generate microplastic, then the microplastic could be considered for its own added addition to the risk calculation for either particulate matter or hazardous air pollutant, but not the plastic itself.

What we see, though, as we've seen with the Superfund program and the RCRA regulations back in the 1980s when they were new, is that the entities that failed to incorporate the cost of waste management into their business structure went bankrupt. That's all we cleaned up, all these bankrupt facilities that failed to include the cost of their newly hazardous-waste-designated materials.

If we regulate the end result of the management of plastic, then it will have an upstream effect. It will cause corporations to be worried about the material risk profile. I think that it would have a chilling effect on entering into the market and the use of plastic materials, packaging, and all the other types of materials that are really only used because there is no downside. If there is a downside, then it would be easier to transition into something else.

That's a long answer, but plastic isn't hazardous. Microplastic is not necessarily hazardous. It depends on the material, and it is the degradation or the downstream product.

Cecilia Diedrich: Something else that I think is really imperative to this conversation, as somebody asked: Shouldn't the physical and chemical components of the potential harms be figured out by companies and approved by regulators before they're put into the marketplace? Can we talk about our regulatory structure?

Mary Ellen Ternes: We know—and Margaret and James can speak to this, too—that under TSCA, plastic is included in the polymer exemption because of the molecular weight, because it's inert.

But also, in talking about upstream, we have an entire industry of polymer manufacturers, and a lot of students delivering their Ph.D. dissertations on the new polymer they're going to create. It's unique and all that. But there's never consideration at that stage of what's going to happen with the ultimate fate of this material. It's not considered in the patenting. It's not an element of the patent law. If it's actually a polymer and molecular weight causes it to be exempt, then that plastic material is a solid material. It's not a chemical that's regulated under TSCA.

And then, there is an additive exemption as well. Additives are not chemically reacting with the material, so they're also not covered. They're just added into the polymer matrix. So, the one police barricade, the checkpoint, is not working for plastic.

55. *See* CWA §502.

Margaret Spring: The Minderoo-Monaco Commission Report was quite adamant that the balance of information is not adequate to the problem. That's why you're seeing a lot of calls for transparency in information, because even companies purchasing the plastic to make into products don't know what is in the plastic they're using. So, this is both a supply chain problem and a regulatory problem.

How do we get ahead of this? How can we try to address that question, which is starting to at least say in this type of product that we do not want this thing? If you don't know what is even in the plastic polymer mixture that you're using, it's very difficult. FDA can, for certain kinds of uses, review what's in material, but then it can't be shared.

There's a lot of secrecy and confidentiality around it. This is a big topic at the treaty that's super important, because otherwise, you're unable to use the tool that you could employ.

Our system is not built for precaution. The other thing the Minderoo-Monaco Commission Report said is that we're conducting an experiment on people. And what's going to clean this up? Liability.

Mary Ellen Ternes: Exactly. As Margaret mentioned, while the rest of the world is looking at chemicals of concern and polymers of concern, and products that shouldn't exist, and uses that shouldn't exist, maybe the United States will still be an insular nation and we'll have a closed use of these materials. But we won't be able to ship it outside of our borders.

I think that what will happen with the Basel Convention is it will become more strict and more specific. The Basel, Stockholm, and Rotterdam Conventions will cause us to not be able to export anything.[56] We are now. We're exporting a lot of solid waste, a lot of plastic for recovery to nations that can't recover it still. And I think we're going to find that we just have no place to go with this material.

56. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Mar. 22, 1989, 1673 U.N.T.S. 125; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Sept. 10, 1998, 2244 U.N.T.S. 337; Stockholm Convention on Persistent Organic Pollutants, May 22, 2001, 2256 U.N.T.S. 119.