Existing U.S. Federal Authorities to Address Plastic Pollution

A Synopsis for Decision Makers

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ELI's Plastics Program is helping support plastic mitigation efforts around the world that are based on transparent and inclusive processes and the best available scientific information. This report builds on the program's previous work such as the *PFAS Deskbook* and *A National Strategy for Ocean Plastics.*

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I. INTRODUCTION

Since synthetic plastic was first developed in the early twentieth century, use and production has grown exponentially. In 1950, the world produced just two million metric tons of plastic per year.[1] By 2019, annual global use reached 460 million metric tons, and that amount is expected to nearly triple by 2060.[2] Every year, it is estimated that 19 to 23 million metric tons of this plastic leaks into the aquatic environment alone—polluting lakes, rivers, and oceans.[3] 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.[4] In short, along with use and production, plastic pollution and its negative impacts have grown exponentially. Whole and broken-down plastics are readily seen on our streets and in our waterways, but they have also permeated the deepest parts of our oceans, the air above our tallest mountains, the food we eat, and our own bodies.

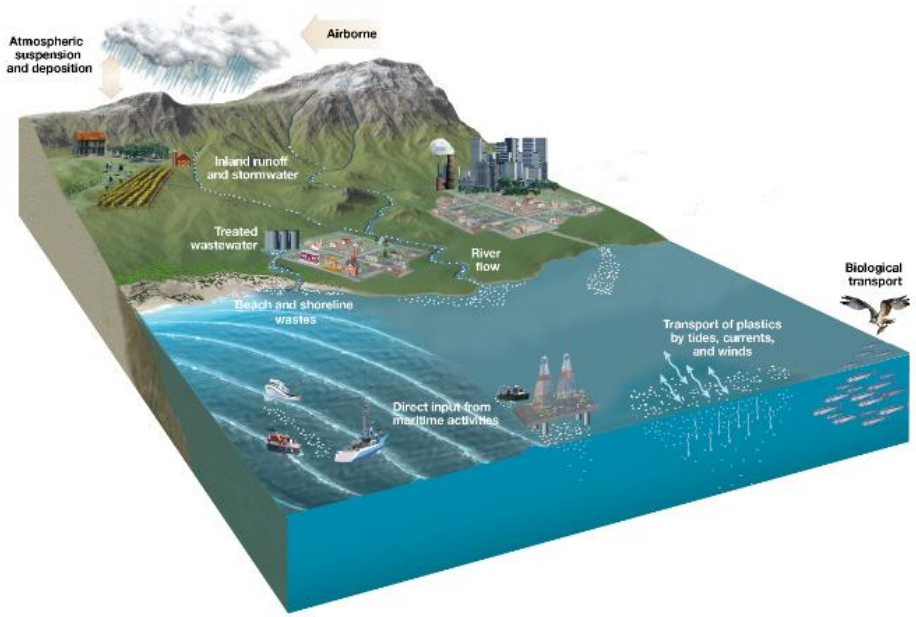

Figure 1. Major transport pathways for plastics from land to the ocean.[5]

[1] Hannah Ritchie et al., *Plastic Pollution*, OUR WORLD IN DATA, https://ourworldindata.org/plastic-pollution (last visited Mar. 14, 2024).

[2] Philip J. Landrigan et al., *The Minderoo-Monaco Commission on Plastics and Human Health*, 89 ANNALS OF GLOBAL PUB. HEALTH 23 (2023) [hereinafter MMC Report], DOI: 10.5334/aogh.4056 (citing https://doi.org/10.1016/j.envint.2023.108225).

[3] *Plastic Pollution*, UNITED NATIONS ENV'T PROGRAMME, https://www.unep.org/plastic-pollution (last visited Mar. 14, 2024).

[4] *See, e.g.*, Martin Wagner et al., *State of the science on plastic chemicals - Identifying and addressing chemicals and polymers of concern*, PLASTCHEM (Mar. 14, 2024) (available at http://dx.doi.org/10.5281/zenodo.10701706) (synthesizing evidence on more than 16,000 chemicals used or present in plastic materials and products that raise significant environmental and health concerns, and of which only six percent are subject to international regulation).

[5] NAT'L ACADS. SCIS., ENG'G, & MED., RECKONING WITH THE U.S. ROLE IN GLOBAL OCEAN PLASTIC WASTE 6 (The National Academies Press, 2022) [hereinafter NASEM Report]. https://nap.nationalacademies.org/catalog/26132/reckoning-with-the-us-role-in-global-ocean-plastic-waste.

In support of addressing this global problem, and pursuant to a congressional mandate in the bipartisan Save Our Seas 2.0 Act of 2020, the National Oceanic and Atmospheric Administration sponsored the Ocean Studies Board of the National Academies of Sciences, Engineering, and Medicine (NASEM) to commence a study on the United States' contribution to global ocean plastic waste and recommend potential means to reduce those contributions. At the close of 2021, NASEM issued its report "Reckoning with the U.S. Role in Global Ocean Plastic Waste" (NASEM Report).[6] This report confirmed the nation's outsized role in global plastic pollution and recommended the United States (U.S.) adopt a plan of action by the end of 2022.

To advance these efforts, the NASEM Report recommended the United States create a "coherent, comprehensive, and crosscutting federal research and policy strategy that focuses on identifying, implementing, and assessing equitable and effective interventions across the entire plastic life cycle to reduce U.S. contribution of plastic waste to the environment, including the ocean."[7] The NASEM Report laid out proposed interventions across the plastic life cycle and provided a brief outline of existing U.S. legal authorities available to support such interventions.[8] This report expands on and adds to those legal authorities and discusses their potential applicability to each intervention area.

A. International Context

Even before the NASEM Report was issued, momentum for global action to end plastic pollution had been building. The global plastic pollution crisis and its impacts on human health and the environment prompted governments across the world to initiate formal negotiations for a United Nations treaty to end plastic pollution. The negotiations on an intergovernmental agreement were born out of the growing recognition that plastic pollution is a global problem requiring an international solution. Following the release of the NASEM report, the United States formally joined these negotiations in 2022 and is working with nations worldwide to identify and address the problems associated with plastic pollution both internationally and domestically.

As the largest generator of plastic solid waste by mass and per capita, the United States has a global responsibility to decrease rates of its current plastic production and waste generation. [9] Regulating the ubiquity of plastics in our environment requires concerted effort at the municipal, state, tribal, federal, and international levels. These efforts will be tested, in part, during the ongoing negotiations pursuant to the March 2022 United Nations Environment Assembly resolution 5/14 "to develop an international legally binding instrument on plastic pollution, including in the marine environment" (Global Plastics Treaty) by 2024.[10]

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[6] NASEM Report, *supra* note 5.
[7] Id. at 16.
[8] *Id.* at Appendix C.
[9] *Id.* at 52 (detailing the interventions that address, among other stages, production, manufacturing, and waste management).
[10] *Intergovernmental Negotiating Committee on Plastic Pollution*, UNITED NATIONS ENV'T PROGRAMME, https://www.unep.org/inc-plastic-pollution (last visited Mar. 14, 2024).

The United States has an important leadership role to play in the negotiations and in meeting the overarching goal of the agreement to address plastic pollution. Aligned with the NASEM recommendations, the United States' stated goal, both domestically and in the Global Plastics Treaty negotiations, is to "eliminate the release of plastic into the environment by 2040" and to "protect human health and the environment." [11] The United States has taken several steps (noted below) in its domestic strategy to achieve these aims. In the international context, the United States has expressed its commitment to negotiating an ambitious, innovative, and inclusive global plastics agreement that will facilitate rapid and meaningful progress.[12] The United States may also align its laws and policies with such an agreement absent formal ratification of a treaty. Given its stated ambitions, therefore, the extent of the United States federal government's existing authority to support and begin implementing a strong international plastics agreement is a crucial policy question.

B. U.S. Domestic Action on Plastic Pollution to Date

Federal domestic actions the United States has taken to date in pursuit of its goal include creating an Interagency Policy Committee on Plastic Pollution and the Circular Economy and committing to environmental justice policies.[13] Federal domestic actions now underway, but not yet finalized or implemented, include the U.S. Environmental Protection Agency's 2023 Draft National Strategy to Prevent Plastic Pollution, various changes to federal procurement policies, updating the Federal Trade Commission's Green Guides, and other government-wide policy action and research activities relevant to plastic pollution. Where known, this report reflects these activities, though there may be additional efforts underway not discussed in this report.

However, to maintain momentum at the federal level for a comprehensive U.S. plastic strategy and action plan, as well as a clear international policy position, the United States should identify existing federal authorities to address the full life cycle of plastics. Within this context, this report builds on the NASEM Report and other sources to provide a summary of existing federal authorities that the United States can use to reduce plastic pollution.

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[11] Monica Medina, *Setting a North Star to Combat Plastic Pollution*, U.S. DEP'T OF STATE (Dec. 7, 2022), https://www.state.gov/dipnote-u-s-department-of-state-official-blog/combat_plastic_pollution; *U.S. National Statement for Intergovernmental Negotiating Committee (INC)-1 on Plastic Pollution*, U.S. DEP'T OF STATE (Nov. 28. 2022), https://www.state.gov/u-s-national-statement-for-intergovernmental-negotiating-committeeinc-1-on-plastic-pollution/; *see also U.S. Actions to Address Plastic Pollution*, U.S. DEP'T OF STATE (Feb. 28, 2024), https://www.state.gov/u-s-actions-to-address-plastic-pollution/ (providing an overview of key federal programs that address plastic pollution).

[12] *U.S. National Statement for Intergovernmental Negotiating Committee (INC)-1 on Plastic Pollution*, U.S. DEP'T OF STATE (Nov. 28. 2022), https://www.state.gov/u-s-national-statement-for-intergovernmental-negotiating-committeeinc-1-on-plastic-pollution/.

[13] Fact Sheet, The White House, President Biden Signs Executive Order to Revitalize Our Nation's Commitment to Environmental Justice for All (Apr. 21, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/21/fact-sheet-president-biden-signs-executive-order-to-revitalize-our-nations-commitment-to-environmental-justice-for-all/.

II. SUMMARY OF THE REPORT

This report offers an objective overview of existing federal authorities—executive orders, statutes, regulations, and programs derived therefrom—that the U.S. federal government can use to achieve the stated national goal of eliminating the release of plastic into the environment by 2040 and protect human health and the environment.[14] The report builds upon the NASEM Report's legal framework and articulated "intervention areas," and arrays these federal authorities against specific intervention areas across the life cycle of plastic. This is done with tables that clearly lay out the intervention areas, the relevant authorities, and the primary implementing agencies. The report then discusses the authorities and their application to the specific intervention areas in more detail. The intended use and value of this report is to inform federal-level officials of the current state of their domestic toolbox to address plastic pollution and, in doing so, help agencies identify opportunities for further regulatory action.

This report focuses on the action the federal government can take to mitigate domestic plastic pollution and does not consider internationally focused policies or programs operated by agencies such as the U.S. Department of State or the U.S. Agency for International Development.

As discussed in this report, federal agencies and commissions have a strong toolkit, with numerous levers they can pull to intervene in the plastics life cycle to reduce plastic pollution. Included among these levers are:

- banning or restricting certain plastic constituent chemicals;
- recognizing and clarifying current definitions of "pollutant" to contemplate the specific risks arising from microplastic particle pollution and its enhanced chemical leachability in all media, including ambient air, navigable waters, and the environment;
- updating industry-specific effluent limitations and emission standards consistent therewith; and
- establishing acceptable thresholds for worker and consumer exposures given the specific chemical and particle hazards posed by plastic materials in all workplace and consumer environments.

While addressing the complexity of plastic pollution and its impacts on human health and the environment will necessarily require new and more comprehensive legislative and executive authorizations,[15] the urgency of this global crisis demands immediate action.[16] The authorities described throughout this report are the vehicles currently available to mitigate plastic pollution.

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[14] *See* Medina, *supra* note 11; *U.S. National Statement for Intergovernmental Negotiating Committee (INC)-1 on Plastic Pollution*, *supra* note 11; *U.S. Actions to Address Plastic Pollution*, *supra* note 11.

[15] Efforts to enact legislation to directly address plastic pollution include iterations of the Break Free From Plastic Pollution Act, Protecting Communities From Plastics Act, REDUCE Act, and Plastic Pellet Free Waters Act.

[16] This report examines laws that could be used to regulate within the life cycle of plastics; a discussion of the on-the-ground implications of these laws is beyond the scope of this report.

Importantly, this report focuses on potential regulatory activity and does not evaluate legal causes of action that would establish liability for plastic and plastic-related pollution. However, plastics pollution is an active source of litigation in the United States.[17] Ultimately, plastics litigation may spur new federal legislation and regulatory action to respond to public concerns while giving the private sector more certainty.[18] Finally, this report does not summarize state or local legal authorities and other actions that seek to mitigate plastic pollution.

[17] *See generally*, *Plastics Litigation Tracker*, N.Y.U. SCH. OF L., https://plasticslitigationtracker.org/ (last visited Mar. 14, 2024).

[18] Mary Ellen Ternes et al., *The Plastic Treaty Negotiations from a Delegate's Perspective*, AMER. INST. OF CHEMICAL ENG'RS, https://www.aiche.org/chenected/2024/01/plastic-treaty-negotiations-delegates-perspective (last visited Mar. 14, 2024).

III. INTERVENTIONS TO ADDRESS PLASTIC POLLUTION

This report analyzes federal authorities with respect to their connection to the various stages of the plastic life cycle. The NASEM Report did not identify a singular, wholesale solution to address global plastic pollution. Instead, based on one of its mandated tasks, the NASEM Report identified a suite of actions (or "interventions") across all stages of the plastic life cycle that could reduce plastic pollution and achieve environmental and social benefits.[19]

Figure 1. Flow diagram of available plastic waste interventions from plastic production to recapture of plastics in the ocean.[20]

These interventions (1–6) address the life cycle of plastics, from production to leakage and disposal into the environment, consistent with the committee's defined statement of task.[21] Subsequent expert reports have identified other impacts and interventions beyond the scope of the NASEM Report that also generally fit within this rubric.[22] Many of these additional impacts and interventions focus on human health and environmental equity and are within the scope of the Global Plastics Treaty, including reducing production of harmful plastic polymers, eliminating chemicals of concern from plastics, and eliminating or severely restricting "problematic, unnecessary, or avoidable" plastics. This analysis considers U.S. authorities to address these issues within interventions 1 and 2, and 3.

The Global Plastics Treaty negotiations similarly takes a life cycle approach to plastic pollution. For example, the following list of treaty elements under discussion roughly track with the intervention areas outlined in this report.

- Primary Plastic Polymers
- Chemicals and Polymers of Concern

[19] NASEM Report, *supra* note 5, at 141–67.
[20] *Id.* at 143 (modified from Jambeck et al. (2018)).
[21] Note, the statement of task focused on sources and flows but did not require a recitation of climate change, human health, or other "impacts" though some are referenced briefly in the report.
[22] *See generally* MMC Report, *supra* note 2 (examining the impacts of plastics across their life cycle on: (1) human health and well-being; (2) the global environment, especially the ocean; (3) the economy; and (4) vulnerable populations—the poor, minorities, and the world's children); *Plastic Pollution*, *supra* note 3 (providing a suite of reports and publications on the impacts of and ways to address plastic pollution).

- Problematic and avoidable plastic products, including short-lived and single-use plastic products and intentionally added microplastics
- Product design, composition, and performance
- Non-plastic substitutes
- Extended producer responsibility
- Emissions and releases of plastic throughout its life cycle
- Waste management
- Trade in listed chemicals, polymers, and products, and in plastic waste
- Existing plastic pollution, including in the marine environment
- Just transition
- Transparency, tracking, monitoring, and labelling[23]

The NASEM Report recognized that the United States has acted in some of these areas, but a more concerted effort is needed, particularly at the production stages.[24] The NASEM report concluded:

> Most federal interventions and marine debris strategies within the United States have focused on Stages 3–5, cleanup and local waste management (U.S. EPA, 2020c; Appendixes C and E), which cannot stem leakage to the environment because of the large volume of flow relative to available resources. To reduce U.S. plastic waste generation, interventions will be required in production, material, and product design stages (Stages 1–2). These interventions require widespread changes in industry standards and practices to make the most efficient and equitable use of government and other resources downstream.[25]

This section provides an overview of the intervention areas identified in the NASEM Report. It also introduces the existing U.S. federal authorities that pertain to each intervention area, set forth in tables in each strategy subsection. The authorities and their applicability to plastics and plastic pollution are discussed in more detail in Section IV: Existing Federal Authorities to Address Plastic Pollution.

A. Intervention 1 – Reduce Plastic Production and Pollution from Production

Reduction of the growth and volume of plastic production as well as pollution from production (including sourcing, manufacturing, compounding, and transportation) is the first stage where plastic waste and pollution can be managed. Reducing the volume of plastic production reduces the volume of plastic eventually entering the solid waste stream or otherwise leaking into the environment (broadly "plastic waste"). Further, reducing the production of plastics that are not

[23] Revised Draft Text of the International Legally Binding Instrument on Plastic Pollution, Including in The Marine Environment, UNEP/PP/INC.4/3 (Dec. 28, 2023), https://wedocs.unep.org/bitstream/handle/20.500.11822/44526/RevisedZeroDraftText.pdf.
[24] NASEM Report, *supra* note 5, at 155.
[25] *Id.*

degradable, reusable, or practically recyclable is crucial in mitigating the impacts of plastic pollution and working towards a circular economy.[26] Addressing pollution from plastic production processes, including plastic recycling and plastic released during general manufacturing processes,[27] is necessary to mitigate plastic production's impact on the environment, human health, and environmental justice. For example, the Environmental Protection Agency's Draft National Strategy to Prevent Plastic Pollution states that "plastic pollution presents complex challenges to addressing the climate crisis and advancing environmental justice that will persist as its production and use increase as projected."[28]

Notably, expert reports have identified an acute need to restrict or eliminate the production of specific plastic polymers and chemical additives of concern to human health.[29] This is a specific intervention now being considered in the Global Plastics Treaty, and a topic relevant to current U.S. actions against some chemicals found in plastic, such as per- and polyfluoroalkyl substances (PFAS). **Please refer to ELI's "PFAS Deskbook (2023)" for a more detailed analysis of legal authorities to address harmful additives like (PFAS) that may be used in plastics.**[30]

The authorities under Intervention 1 offer strategies to reduce plastic production and its associated pollution in two fundamental ways: (1) by reducing production capacity and associated pollution

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[26] *Id*. at 144.

[27] Recent recognition that manufacturing—particularly food production processes—utilize plastic equipment in process assembly lines has caused concern about the release of plastic particles and chemicals into food products. Similar concerns have arisen from other manufacturing processes that use plastics. *See, e.g., Minimizing microplastics in the food processing line,* JBTC.COM (2022), https://www.jbtc.com/plant-based-protein/blog/minimizing-microplastics-in-the-food-processing-line/ (last visited Mar. 14, 2024); Hans Bouwmeester, Peter C. H. Hollman, and Ruud J. B. Peters, *Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology,* 49 ENVIRON. SCI. TECHNOL. 8932 (Jul. 2015).

[28] U.S. ENVTL. PROT. AGENCY, DRAFT NATIONAL STRATEGY TO PREVENT PLASTIC POLLUTION, PART OF A SERIES ON BUILDING A CIRCULAR ECONOMY FOR ALL 5 (Apr. 2023) [hereinafter EPA DRAFT NATIONAL STRATEGY TO PREVENT PLASTIC POLLUTION], https://www.epa.gov/system/files/documents/2023-04/Draft_National_Strategy_to_Prevent_Plastic_Pollution.pdf.

[29] *See, e.g.,* MMC Report, *supra* note 2 (examining the impacts of plastics' across their life cycle on human health and well-being, the global environment (especially the ocean), the economy, and vulnerable populations (the poor, minorities, and the world's children); and offering science-based recommendations designed to support development of a Global Plastics Treaty, protect human health, and save lives); *Chemicals in Plastics: A Technical Report*, UN ENV'T PROGRAMME & SECRETARIAT OF THE BASEL, ROTTERDAM, AND STOCKHOLM CONVENTIONS (2023), https://www.unep.org/resources/report/chemicals-plastics-technical-report (providing the state of knowledge on chemicals in plastics and calling for urgent action to address chemicals in plastics as part of the global action on plastic pollution).

[30] *See generally* JAMES B. POLLACK ET AL., PFAS DESKBOOK 20 (Nov. 2023) [hereinafter PFAS DESKBOOK] (available for purchase at https://www.eli.org/eli-press-books/pfas-deskbook) (reducing plastic pollution from the production process might include "[r]eview[ing] and update[ing], as appropriate, regulations relating to air emissions and water discharges of pollutants or waste disposal from plastic production and recycling facilities, and other health and safety measures, including regulation of the production and transport of plastic pellets. In addition, work across the federal government to prevent accidental releases of hazardous chemicals related to plastic production into the environment during transit.").

through regulation of facilities and feedstock sources; and (2) by restricting the production of certain primary polymers and plastic chemicals of concern to human health).

1. Regulate and reduce production capacity and associated pollution

Reducing production capacity could be achieved through regulation of facilities and feedstock sources, siting rules, and removal or adjustment of financial incentives. The Clean Air Act, Clean Water Act, National Environmental Policy Act, and Occupational Safety and Health Act offer potential avenues for regulating the permitting of plastic production facilities and related pollution.[31]

Authorities to Reduce Plastic Production and Pollution from Production

Strategy: Regulate production capacity and associated pollution

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Clean Air Act	EPA	Under the Clean Air Act, EPA can consider microplastic as a unique "air pollutant" and propose rulemaking specifically governing microplastic particles as a fraction of the criteria pollutant $PM_{2.5}$ pursuant to the National Ambient Air Quality Standards (NAAQS) and the New Source Performance Standards (NSPS), and a hazardous air pollutant pursuant to the National Emission Standards for Hazardous Air Pollutants (NESHAP) similar to asbestos particles. Such rulemaking could improve microplastic monitoring and govern plastics production, as well as microplastic emitted from all manufacturing operations utilizing plastic materials, providing human health and environmental benefits and potentially driving down demand for plastic use in

[31] Indirect methods might also include simple recognition of pollutants not currently recognized. For example, microplastic particles under the CAA and instances where plastic constituents such as PFAS are being included in the definition of "hazardous constituent" under RCRA and in the definition of "hazardous substance" under CERCLA. *See* Listing of Specific PFAS as Hazardous Constituents, 89 Fed. Reg. 8,606 (Feb. 8, 2024) (proposed rule); *Key EPA Actions to Address PFAS*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/pfas/key-epa-actions-address-pfas (last visited Mar. 14, 2024) (advance notice of proposed rulemaking to inform potential CERCLA PFAS regulations). All of these indirect measures create regulatory uncertainty, potentially driving companies away from this new and yet to be defined risk. While nuanced, this effect—increased enforcement potential, liability, litigation risk that arises from focus not just on MP but also additives—can drive down demand.

		such contexts. EPA can also exercise its section 309(a) review authority to help other federal agencies fulfill their National Environmental Policy Act (NEPA) obligations in identifying and reducing potential adverse effects from proposed actions.
Clean Water Act	EPA	More thoroughly regulating the discharge limits of chemicals and additives most closely associated with plastic production—as would then be translated into National Pollutant Discharge Elimination System (NPDES) permits—is one way in which EPA could reduce pollution from plastic production.
National Environmental Policy Act	CEQ; All federal agencies	U.S. federal agencies can consider how plastic and petrochemical manufacturing facilities implicate human health and environmental justice concerns in their cumulative impacts analysis for actions that trigger NEPA reviews. This may arise during the siting processes for plastic production or manufacturing facilities.
Occupational Safety and Health Act	OSHA	Under the Occupational Safety and Health Act, OSHA has authority to regulate the plastics manufacturing process to ensure no toxic or hazardous pollution threatens workers' safety.

2. Restrict certain problematic and unnecessary primary polymers, chemicals of concern, and pollution

This strategy can be achieved by setting production standards as well as banning, regulating, or reducing certain types of plastic based on harm. The Toxic Substances Control Act and Microbead Free Waters Act offer the opportunity to limit production or certain polymers or chemicals based on harm to human health and the environment.

Authorities to Reduce Plastic Production and Pollution from Production		
Strategy: Restrict certain problematic and unnecessary primary polymers, chemicals of concern, and pollution		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Toxic Substances Control Act	EPA	Under the Toxic Substances Control Act sections 5 and 6, EPA has authority to regulate toxic chemicals and could regulate the manufacturing of plastics and their chemical constituents (such as individual additives and plasticizers). EPA could also regulate significant new uses of plastic products and products manufactured from plastic waste under section 5.
Microbead Free Waters Act	FDA	The Microbead Free Waters Act directly bans cosmetic products containing plastic microbeads and is an example of Congress limiting production (indirectly) to reduce pollution of certain plastics.

B. Intervention 2 – Innovate Material and Product Design (including reducing additives and chemicals of concern)

Reformulating plastics to eliminate additives that pose risks to human health and designing plastic products to facilitate their reuse and management at end of life are important to the goal of safe and sustainable circularity.[32] In addition, development of plastic substitutes that effectively and safely biodegrade more quickly or are more easily recycled without harmful emissions or outputs can mitigate the impacts of plastic pollution where there is a safe and sustainable end of life for the substitute (including a functional management system). Developing safe and sustainable alternatives for items more likely to leak or leach into the environment can be a particularly impactful strategy.[33] Public policy can aid the development of these alternatives by enforcing product standards, encouraging voluntary commitments from the private sector, or implementing labeling and marketing regulations. Sustainable or "green" chemistry offers opportunities to identify safe substitutes.

[32] *See* UNITED NATIONS ENV'T PROGRAMME & SECRETARIAT OF THE BASEL, ROTTERDAM, & STOCKHOLM CONVENTIONS, CHEMICALS IN PLASTICS: A TECHNICAL REPORT (2023), https://www.unep.org/resources/report/chemicals-plastics-technical-report (assessing chemicals in plastics and the human health implications); *see also* Kara Law and Ramani Narayan, *Reducing environmental plastic pollution by designing polymer materials for managed end-of-life*, 7 NATURE 104-116 (2022).

[33] NASEM Report, *supra* note 5, at 144.

1. Enforceable product standards for manufacturers of plastic and plastic goods

This strategy refers to enacting limits on the plastic content of specific products and packaging, or imposing other design specifications that can simplify, de-toxify, or otherwise facilitate plastic products' reuse and recyclability.[34] Such interventions could address rising global evidence and public concern about human health impacts of plastics (e.g., monomers, polymers), microplastics, and chemical additives to plastics.[35]

Beyond the scope of what is identified in the NASEM Report, enforceable product standards could also ensure that plastics and plastic products are safe and sustainable by requiring chemical transparency and removing or addressing chemicals in plastics that pose threats to human health and the environment, as noted above.[36]

Authorities to Spur Innovation in Material and Product Design

Strategy: Enforceable product standards for manufacturers

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Consumer Product Safety Improvement Act	CPSC	The CPSC is broadly authorized under the Consumer Product Safety Improvement Act to "protect the public against unreasonable risks of injuries and deaths associated with consumer products." The Commission has used this authority to ban phthalates in plastic children's toys, among other substances.
Food, Drug, and Cosmetic Act	FDA	Through the Food, Drug, and Cosmetic Act, FDA can establish enforceable product standards for plastic manufacturers. Examples include food additive regulations, which governs the use of polymers in substances used in food-contact products.

[34] *Id*. at 158.
[35] *See, e.g.,* MMC Report, *supra* note 2 (examining how plastics impact human health); UNITED NATIONS ENV'T PROGRAMME & SECRETARIAT OF THE BASEL, ROTTERDAM, & STOCKHOLM CONVENTIONS, CHEMICALS IN PLASTICS: A TECHNICAL REPORT (2023), https://www.unep.org/resources/report/chemicals-plastics-technical-report (assessing chemicals in plastics and the human health implications).
[36] *See generally* PFAS DESKBOOK, *supra* note 30 (providing a blueprint for how to address harmful chemicals in manufacturing and releases).

Microbead Free Waters Act	FDA	The Microbead Free Waters Act directly bans cosmetic products containing plastic microbeads, creating an enforceable product standard.
Sustainable Chemistry Research and Development Act	OSTP	The interagency working group enabled by the Sustainable Chemistry Research and Development Act may facilitate the creation of plastic product standards by establishing common definitions, frameworks, partnerships, and funding activities.
Toxic Substances Control Act	EPA	Through sections 5 and 6 of the Toxic Substances Control Act, the EPA can effectively impose enforceable product standards on plastic products by, for example, restricting the use of certain harmful additives.

2. Voluntary commitments and collaborations for innovative material and product design

This strategy refers to methods for encouraging the voluntary advancement of innovative material and product designs. Such methods may include government grants for research and development programs, tax incentives for design innovation, or encouraging the private sector to follow the principles of green engineering and green chemistry.[37]

Authorities to Spur Innovation in Material and Product Design

Strategy: Voluntary commitments and collaborations

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Energy Independence and Security Act of 2007; Energy Research and Innovation Act of 2018	DOE	These laws authorized the "Strategy for Plastics Innovation" (SPI)—a voluntary partnership among consortia and centers that "spans the full research, development, and deployment spectrum to address key challenges that limit plastic recycling." One of four enumerated strategic goals announced for the SPI is to design renewable plastics and bioplastics.

[37] NASEM Report, *supra* note 5, at 158.

Food, Drug, & Cosmetic Act	FDA	Supplementary to the premarket review process, FDA allows manufacturers of post-consumer recycled plastic (PCR) to voluntarily submit relevant recycling process information to the FDA. This process may help to improve plastic material design by providing manufacturers the opportunity to receive informal agency feedback before the formal regulatory processes commence.
Internal Revenue Code	IRS	The federal research and development tax credit, 26 U.S.C. § 41, can function as an incentive for plastic manufacturers to improve plastic material design and manufacturing processes.
National Institute of Standards and Technology Act	NIST	The research programs concerning plastics carried out by NIST are multi sector collaborations vital to efforts to reduce plastic pollution at all stages of the plastic life cycle.
Pollution Prevention Act	EPA	This law authorizes the Safer Choice Program. By requiring a certain percentage of recycled content for certified Safer Choice products, the program incentivizes product manufacturing and design that relies less on primary plastic feedstock.
Save Our Seas 2.0 Act	Department of Commerce	The Save Our Seas Act's "Genius Prize" is a federal incentive to drive innovation in plastic production and packaging redesign.
Sustainable Chemistry Research and Development Act	EPA	EPA can incentivize the development of safe, non-toxic plastic additives via green chemistry "that can confer desired material properties without harming human health or environmental health."

3. Standards for labeling and marketing

This strategy refers to the regulation of packaging labels, including labeling requirements and voluntary "green" certifications.[38] These policies can advance the development of innovative plastics alternatives by allowing consumers to make better-informed choices, thereby increasing market demand.

[38] *Id*. at 160.

Authorities to Spur Innovation in Material and Product Design

Strategy: Standards for labeling and marketing		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Farm Bill	USDA	The BioPreferred Program—authorized through the 2002 Farm Bill—allows businesses that make products with a minimum content of biobased material to display the USDA Certified Biobased Product label.
Federal Trade Commission Act	FTC	The FTC creates nonbinding standards (i.e., Green Guides) for marketers subject to the Federal Trade Commission Act (FTCA) that are intended to help prevent deceptive marketing claims of environmental attributes of products. The FTC can also pursue enforcement actions against violations of the FTCA. Enforcement of the FTCA may be informed by the FTC's Green Guides.
Pollution Prevention Act	EPA	Through its Safer Choice Program, the EPA can improve standards for the labeling of recyclable products by requiring manufacturers to clearly identify how the consumers can recycle the given product.

C. Intervention 3 – Decrease Waste Generation

The NASEM report specifies that actions under this intervention area "reduce unnecessary plastic wastes by reducing the use of plastic products with short disposable use periods, such as some single-use applications."[39] As opposed to direct regulation or limitations on plastic production (Intervention 1) or incentivizing the development of more environmentally friendly plastic alternatives (Intervention 2), Intervention 3 calls for limiting the use of plastics across the economy. Examples of policy interventions in this intervention area include prohibiting specific uses of certain plastic products (e.g., local plastic bag bans for large retailers), issuing plastic-free government procurement rules, and implementing fiscal incentives to dissuade the purchase of plastics (e.g., plastic bag fees).[40]

[39] *Id*. at 144.
[40] *Id*. at 160–62.

The NASEM report identified seven strategies to decrease waste generation.

1. Plastic product bans (and substitutes)

This strategy refers to banning specific plastic products based on the product's negative impact on the environment after disposal. Common examples include bans on single-use plastic products such as bags, straws, and other food service items. Many U.S. states and localities have implemented these forms of plastic product bans, [41] but federal action has been sparser.

Authorities to Decrease Waste Generation

Strategy: Plastic product bans

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Microbead Free Waters Act	FDA	The Microbead Free Waters Act directly bans cosmetic products containing plastic microbeads.
Toxic Substances Control Act	EPA	Under the Toxic Substances Control Act, the EPA could restrict the commercialization of plastic products based on their use of certain additives, plasticizers, or other chemicals.

2. Mandatory procurement rules favoring reusable products

This strategy calls for the federal government to use its substantial purchasing power to support the development of plastic alternatives. The federal government spends between $650 and $700 billion on products and services each year, making it the largest single consumer in the world.[42] Government procurement decisions can have substantial impacts through their direct market

[41] *Id*. at 161.

[42] Nichola Groom, *U.S. Will Consider Limiting Plastics in Federal Purchasing*, REUTERS (July 7, 2022), https://www.reuters.com/world/us/us-will-consider-limiting-plastics-federal-purchasing-2022-07-06/; Fact Sheet, Office of Mgmt. & Budget, Exec. Office of the President, Biden-Harris Administration Announces New Better Contracting Initiative to Save Billions Annually (Nov. 8, 2023), https://www.whitehouse.gov/omb/briefing-room/2023/11/08/fact-sheet-biden-harris-administration-announces-new-better-contracting-initiative-to-save-billions-annually; Jason S. Miller, *Memorandum for the Heads of Executive Departments and Agencies,* M-22-03, OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT (Dec. 2, 2021), https://www.whitehouse.gov/wp-content/uploads/2021/12/M-22-03.pdf ("The Federal Government is the largest consumer of goods and services in the world, spending more than $650 billion each year").

impact by supporting emerging supply chains for innovative products and by helping innovative products achieve economies of scale.

Authorities to Decrease Waste Generation

Strategy: Mandatory procurement rules favoring reusable products

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Executive Order 14057, Catalyzing American Clean Energy Industries and Jobs Through Federal Sustainability	Executive Office of the President	Executive Order 14057 directs federal agencies to minimize waste (particularly related to single-use plastic products) and support recycled products and a circular economy in their procurement practices.
Farm Bill	USDA	The USDA's BioPreferred Program—authorized in the 2002 Farm Bill—requires federal agencies give preference to biobased alternatives when purchasing certain products for procurement.
Federal Acquisition Regulation	GSA; DOD; NASA; and EPA	The Federal Acquisition Regulation can be amended to direct the major federal procurement agencies (namely the GSA, DOD, and NASA) to prioritize sustainable plastic alternative products and services. Further, EPA can utilize and update its Environmentally Preferably Purchasing Program and associated recommendations to procure environmentally preferrable products and services.
National Defense Authorization Act of 1994	Navy	Through the PRIME and WRAPS programs, authorized by the National Defense Authorization Act, the Navy can continue to evaluate supply initiatives and act to reduce or eliminate solid waste, including plastic waste, through procurement of more sustainable products, materials, and processes to reduce plastic waste and at-sea disposal.

3. Regulate and reduce loss of preproduction pellets that become waste

Preproduction pellets are small pieces of plastic resin that serve as the raw material for various plastic processing methods.[43] The production, use, and disposal of plastic pellets can contribute to plastic pollution. For example, pellets can spill during transportation or during improper disposal activities. Over time, these pellets break down into microplastics that have adverse effects on ecosystems, wildlife, natural resources, and human health.[44] Targeting the adverse impacts of preproduction pellets can be accomplished by intervening specifically during the production and disposal phases.

Authorities to Decrease Waste Generation

Strategy: Regulate and reduce loss of preproduction pellets that become waste

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Clean Water Act	EPA	EPA could consider listing microplastics (including plastic pellets) as a conventional pollutant under the Clean Water Act section 304(a)(4), the standards for which would need to be incorporated into section 402 permits; or consider speciation of microplastics through current section 402 Total Suspended Solids permit limitations to set more stringent monitoring and discharge limitations

4. Fiscal tools (i.e., fees, taxes, incentives)

This strategy refers to enacting fees on the purchase of plastic items at their point-of-sale to disincentivize their use.[45] While this strategy is common among states and localities, there is no similar federal strategy. The federal government may be able to provide guidance and technical support to help states enact incentives, disincentives, or develop other fiscal tools.

5. Deposit return systems

[43] NASEM Report, *supra* note 5, at 160.
[44] Junaid Saleem et al., *Assessing the Environmental Footprint of Recycled Plastic Pellets: A Life-Cycle Assessment Perspective,* 32 ENVTL. TECH. & INNOVATION 103298 (2023).
[45] NASEM Report, *supra* note 5, at 160.

Deposit return systems incentivize the return of a plastic packaging product for recycling by imposing an additional refundable deposit on the product's sale.[46] The most common form of this strategy is a "bottle bill." These laws impose a small fee (e.g., five or ten cents) on the sale of certain products like water bottles and beer or soda cans. Consumers and retailers can recoup this "deposit" by recycling the product. Ten U.S. states have bottle bills in effect, which have successfully improved recycling rates.[47] Though there is no specific authority authorizing the establishment of a federally run deposit return system, the federal government may be able to provide guidance and technical support to help states establish deposit return systems.[48]

Authorities to Decrease Waste Generation

Strategy: Deposit Return Systems

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Pollution Prevention Act	EPA	Through the Pollution Prevention (P2) Act's authorization to develop strategies to promote the wider adoption of source reduction and pollution prevention strategies, gather and share information on source reduction and recycling techniques, and otherwise contribute to state and local capacity building efforts, the EPA could issue guidance and technical assistance on the development of policies such as deposit return systems.

6. Extended producer responsibility (EPR) requirements (end-of-life management)

Similar to deposit return systems, EPR is a policy approach that places the responsibility for the environmental impact of a product throughout its life cycle on the manufacturer or producer. Specific requirements and designs of EPR schemes can vary greatly. In the plastics context, however, they normally involve "take back" and reuse or recycling schemes where the law requires producers to take back their products at the end of their life cycles for proper disposal, reuse, or recycling.

[46] Margaret A. Walls, *Deposit-Refund Systems in Practice and Theory,* RESOURCES FOR THE FUTURE (Nov. 23, 2011), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1980142.
[47] Michael Corkery, *Beverage Companies Embrace Recycling, Until It Costs Them,* N.Y. TIMES (Jul. 5, 2019), https://www.nytimes.com/2019/07/04/business/plastic-recycling-bottle-bills.html.
[48] Statutes such as the Pollution Prevention Act authorizes the federal government to issue guidance regarding source reduction and other pollution prevention strategies, likely including extended producer responsibility systems. *See* 42 U.S.C. § 13105.

Authorities to Decrease Waste Generation

Strategy: Extended producer responsibility requirements (end-of-life-management)

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Pollution Prevention Act	EPA	Through the Pollution Prevention (P2) Act's authorization to develop strategies to promote the wider adoption of source reduction and pollution prevention strategies, gather and share information on source reduction and recycling techniques, and otherwise contribute to state and local capacity building efforts, the EPA could issue guidance and technical assistance on the development of policies such as EPR systems.
Resource Conservation and Recovery Act	EPA	EPA can examine how EPR systems have fared in states, for example those states with the Resource Conservation and Recovery Act Subtitle D programs, to identify lessons learned. This may help inform EPA's decision making in determining whether it has a role to play in issuing guidance on best practices.
Sustainable Chemistry Research and Development Act	OSTP; EPA	The EPA's definition of green chemistry specifically applies across the life cycle of a product, which could extend producer responsibility requirements for plastics.

7. Reusable and refillable systems

This strategy refers to making investments in affordable and convenient reuse and refill systems to reduce single-use packaging.

Authorities to Decrease Waste Generation		
Strategy: Reusable and refillable systems		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Energy Independence and Security Act of 2007; Energy Research and Innovation Act of 2018	DOE	DOE research—for example, which is produced by the consortia and centers that together compose "Strategy for Plastics Innovation"—has and can continue to serve as an agent of intervention area 3 generally. Research that builds the body of literature on the plastic circular economy may have the effect of decreasing waste generation.
Pollution Prevention Act	EPA	EPA's Pollution Prevention Grants can be used for multiple strategies to prevent pollution. Such grants have been used to support reuse and refill systems.
Marine Debris Act	NOAA	NOAA's Marine Debris Program supports projects across the country preventing marine debris pollution, especially through outreach, education, and funding pilot projects. These projects often support the use of reusable and refillable systems.

D. Intervention 4 – Improve Waste Management (Prevent or Reduce Disposal/Discharge)

Actions in Intervention 4 involve improving solid waste management infrastructure, collection, treatment, and disposal. The goal is to increase the collection of plastics into waste management systems and plastic recycling facilities and isolate or treat remaining plastic waste to avoid leakage into the environment.

1. Disposal, collection, and recycling improvements

Actions in this strategy mostly focus on improving waste management systems, such as supporting and developing new technologies for source separation, industrial composting, reuse, and recycling. It can also include new approaches to waste management collection, such as maintaining receptables in plastic "hotspots" or high-traffic areas. In some cases, extended producer responsibility schemes (see intervention 3) may provide additional financial support for improving collection and separation infrastructure.

Authorities to Improve Waste Management

Strategy: Disposal, collection, and recycling improvements

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Coastal Zone Management Act	NOAA; EPA	The Coastal Zone Management Act Grant Programs provide NOAA and the EPA authority to fund projects that may reduce plastic pollution in coastal areas. Specifically, the Coastal Zone Enhancement Grant Program authorizes funding projects that can reduce marine debris (the majority of which is plastic), and the Nonpoint Pollution Control Program authorizes grants the help states establish programs to limit nonpoint source pollution into coastal waters, including from plastics.
Department of Energy Organization Act; Energy Policy Act of 2005; Energy Research and Innovation Act of 2018	DOE	The Department of Energy Organization Act and Energy Policy Acts of 2005 and Energy Research and Innovation Act of 2018 authorize DOE to improve waste management through disposal, collection, and recycling improvements. DOE can provide financial assistance for short- and long-term basic and applied research activities of the agency.
Energy Independence and Security Act of 2007; Energy Research and Innovation Act of 2018	DOE	DOE has existing authority to engage in cross-cutting research and development within the agency (e.g., Strategy for Plastics Innovation). DOE's statutory support to accelerate energy innovation, particularly within the context of technologies that would enable improved upcycling processes, can conceivably help to improve plastic waste management.
Emergency Planning and Community Right-to-Know Act	EPA	The Emergency Planning and Community Right-to-Know Act (EPCRA) empowers the EPA to add more chemicals to the Toxic Release Inventory, thereby mandating EPCRA's disclosure requirements. These public disclosure requirements incentivize plastics facilities to reduce their disposal or discharge of chemicals into the environment.

Marine Plastic Pollution Research and Control Act of 1987, amending the Act to Prevent Pollution from Ships, implementing Annex V of MARPOL 73/78	USCG	The Marine Plastic Pollution Research and Control Act requires that there be adequate waste management onboard vessels and reception facilities at U.S. ports.
Resource Conservation and Recovery Act	EPA	The Resource Conservation and Recovery Act (RCRA) authorizes the Sustainable Materials Management Program, which primarily serves as a collaborative platform as well as a measurement and assessment tool that supports a systematic approach to using and reusing materials more productively over their entire life cycle. As EPA prioritizes its National Strategy to Prevent Plastic Pollution, the agency can utilize the SMM program resources to analyze information and provide resources to promote waste reduction, collection, disposal, and recycling improvements. Additionally, more thoroughly regulating the disposal of plastic, microplastics, and certain toxic polymers under RCRA would directly improve plastic disposal, collection, and recycling. Listing microplastics as hazardous waste under RCRA or characteristic hazardous waste would conceivably improve the regulatory framework for "cradle-to-grave" responsibility for hazardous waste generators, including plastic producers. Listing certain toxic plastic polymers under RCRA could accomplish a more tailored approach towards the same objective.
Save Our Seas 2.0 Act	EPA	The EPA's Solid Waste Infrastructure for Recycling Program (SWIFR)—authorized by the Save Our Seas 2.0 Act—also funds state and local projects that advance the National Recycling Strategy.

2. Plastic waste export/import controls

This strategy refers to limits, bans, or voluntary attempts to eliminate plastic waste exports and imports to incentivize plastic waste reduction. The Basel Convention is currently the primary international treaty that aims to control and reduce the transboundary movements of hazardous waste, including certain types of plastic waste; however, the United States is not a signatory to the Basel Convention. Nevertheless, existing domestic authorities under the Resource Conservation and Recovery Act (RCRA) provide a legal basis for regulating export and import of plastic waste.

Authorities to Improve Waste Management

Strategy: Plastic waste export/import controls		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Resource Conservation and Recovery Act	EPA	EPA has existing authority under the Resource Conservation and Recovery Act to control plastic waste import and export.

3. Treatment improvements to remove plastic waste from discharges

This strategy refers to removing plastic waste from regulated point source discharges through methods such as wastewater treatment standards that restrict microplastics and microfibers in effluent water.

Authorities to Improve Waste Management

Strategy: Treatment improvements to remove plastic waste from discharges		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Clean Water Act	EPA	EPA could better manage the introduction and re-introduction of microplastics and nanoplastics into the environment by amending its regulations for application of biosolids at 40 C.F.R. Part 503 to require testing for microplastics and nanoplastics, prohibiting

		land application where detected, and establishing strict pre-treatment requirements for biosolids before land application.

4. National Pollutant Discharge Elimination System, stormwater limits and treatment

The National Pollutant Discharge Elimination System (NPDES) is a Clean Water Act regulatory program that manages water pollution from point sources such as industrial facilities, municipal wastewater treatment plants, and stormwater drainage systems. Permits issued under the NPDES can set pollution control limits, which, in turn, can address certain aspects of plastic pollution.

Authorities to Improve Waste Management

Strategy: National Permit Discharge Elimination System, stormwater limits and treatment

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Clean Water Act	EPA	Under the Clean Water Act, NPDES permit writers can impose additional monitoring and data collection requirements on NPDES permittees (including plastic producers; as well as potentially manufacturers reliant on plastic production equipment, which could be releasing plastic particles).

5. Ocean/river discharge limits

This strategy refers to establishing regulatory limits on plastics in ocean and river discharges specifically. While the Clean Water Act remains the principal authority for regulating ocean and river discharges from point sources, the Coastal Zone Management Act confers additional authority for ocean nonpoint source pollution.

Authorities to Improve Waste Management		
Strategy: Ocean and river discharge limits		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Coastal Zone Management Act	EPA; NOAA	The Coastal Zone Management Act incentivizes states to adopt coastal management plans to manage coastal resources and limit nonpoint source pollution. This includes nonpoint source plastic pollution from sources like stormwater runoff and litter.

E. Intervention 5 – Capture Plastic Waste (to remove plastic waste from the environment)

This intervention refers to the capture of plastic waste before and after its disposal into the environment. This intervention is generally applied in marine environments and can include the clean-up of plastic waste from its accumulation in and around waterbodies. This back-end approach to addressing plastic pollution has a high visibility factor because the removal of plastic directly from waterways can be easily seen. However, as the NASEM Report articulates, this intervention is expensive and less practical than other interventions because plastic waste can quickly fragment (i.e., become microplastic or nanoplastic) and disperse over large areas, which can frustrate clean-up or capture efforts.[49]

1. Remove plastic waste from waterways

This strategy refers to efforts to clean up plastic waste from beach, river, and inland waterways. Limited examples of this strategy include the installation of trash capture devices in waterways—as has been implemented in California through its Trash Amendments—and federal agency-led beach clean-up and pollution education events.

[49] NASEM Report, *supra* note 5, at 144–45.

Authorities to Capture Plastic Waste

Strategy: Remove plastic waste from waterways

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Clean Water Act	EPA	Funds available through the Clean Water Act's State Revolving Fund for projects that successfully implement trash capture devices is one example of how EPA can exercise its discretion to assist states, tribes, and municipalities with capture and removal of trash from local waterways.
Marine Debris Act	NOAA	NOAA's Marine Debris Program supports projects across the country preventing marine debris pollution, especially through outreach, education, and funding pilot projects. These projects often involve cleanup efforts to remove plastic waste.
National Park Service Organic Act of 1916 and National Park Service General Authorities Act of 1970	NPS	NPS beach cleanup program provides for a direct opportunity to capture waste by removing plastic waste from the environment.
Safe Drinking Water Act	EPA	A binding National Primary Drinking Water Regulation (NPDWR) for microplastics would require certain monitoring and technological improvements for publicly owned and private water supplies.

2. Remove plastic waste from ocean wildlife and habitats

This strategy contemplates efforts that target plastic waste removal specifically from critical ocean habitats.

Authorities to Capture Plastic Waste

Strategy: Remove plastic waste from ocean wildlife and habitats

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Endangered Species Act	NOAA; FWS	The Endangered Species Act is limited in their ability to directly reduce plastic pollution. However, they are strong authorities for regulating how plastic pollution impacts species and habitat. The laws can force federal agencies to consider the impact of existing plastic pollution on a species' survival, and agencies could incorporate plastic removal as part of a species' recovery plan.
Marine Debris Act	NOAA	NOAA's Marine Debris Program supports locally driven, community-based marine debris removal projects across the country.
National Defense Authorization Act for Fiscal Year 2021, Ocean Justice Strategy	CEQ, OSTP	The Ocean Policy Committee—authorized by the National Defense Authorization Act for Fiscal Year 2021—may guide federal agencies to act on marine plastic pollution removal.
Outer Continental Shelf Lands Act	Department of the Interior	The Outer Continental Shelf Lands Act authorizes DOI to mandate the offshore energy industry recover and remove plastic waste and marine debris stemming from its operations.

3. Remove plastic waste from localized hotspots

Plastic waste can become concentrated in local hotspots, which can be addressed first through research and remediated through specific waste capture devices and land-based cleanups. Federal agencies may take cues from state clean-up initiatives targeted at historical releases of certain waste, such as plastic pellets. The Environmental Protection Agency (EPA) may also consider, using existing federal authority previously utilized for "open dumps" to specifically address plastic waste hotspots under RCRA. EPA could also compel action by responsible parties to address plastic pollution as potential CERCLA hazardous substances or compel action by owners and operators to address plastic pollution as potential RCRA hazardous constituents.

Authorities to Capture Plastic Waste

Strategy: Remove plastic waste from localized hotspots

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Clean Water Act	EPA	The same mechanism to remove trash from waterways can be applied to remove plastic waste from localized hotspots. Funds available through the Clean Water Act's State Revolving Fund for projects that successfully implement trash capture devices is one example of how EPA can exercise its discretion to assist states, tribes, and municipalities with capture and removal of trash from certain hotspots.
Comprehensive Environmental Response, Compensation, and Liability Act	EPA	Should EPA update its Toxic Pollutant List and Priority Pollutant List under the Clean Water Act to account for pollutants most commonly associated with plastic production, additional "back-end" levers would be available under the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") to remediate the release of such pollutants.
Marine Debris Act	NOAA	NOAA's Marine Debris Program supports locally driven, community-based marine debris removal projects across the country.
National Aeronautics and Space Act of 1958	NASA	NASA operates programs that use satellite technology to identify plastic waste hotspots—critical to the eventual removal of plastic pollution from the oceans. NASA can continue to support, develop, and expand such projects and programs.
Resource Conservation and Recovery Act	EPA	EPA may consider issuing guidance clarifying that areas where plastic waste has been intentionally dumped, negligently escaped, or has otherwise accumulated and resulted in plastic hotspots must be evaluated for identification as "open dumps," which are prohibited under the Resource Conservation and Recover Act section 4003(a).

F. Intervention 6 – Minimize Ocean Disposal

The goal of this intervention is to reduce plastic waste discharges into the ocean directly from vessels, point sources, or platforms. As identified in the NASEM Report, successful implementation of this intervention will require dedicated resources and funding, as well as attendant monitoring and assessment, research and development, and public outreach and transparency initiatives.[50]

Such measures may be implemented by global treaty organizations and national, state, local, and tribal governments. Examples of existing international mechanisms include the International Convention for the Prevention of Pollution from Ships (MARPOL), which the United States has implemented through the Marine Plastic Pollution Research and Control Act of 1987, discussed below; the European Union Directive 2019/904 on single-use plastics, which provides for extended producer responsibility and proper disposal of fishing gear made of plastics; and various national and state fishing gear marking requirements.

The NASEM Report identified the following strategies for U.S. action in this intervention.

1. Increase enforcement for at-sea disposal

Enforcement mechanisms for at-sea dumping and disposal of plastic waste (including trash) could be improved and pursued more aggressively. The United States currently regulates or has the authority to regulate at-sea disposal of plastics under the following authorities.

Authorities to Minimize Ocean Disposal

Strategy: Increase enforcement at-sea disposal		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Marine Debris Act	NOAA	NOAA's Marine Debris Program supports several international coordination efforts designed to minimize ocean disposal. This includes efforts specifically designed to reduce at-sea abandonment of fishing gear, like the Global Ghost Gear Initiative and the Global Partnership on Marine Litter.

[50] NASEM Report, *supra* note 5, at 145.

Marine Plastic Pollution Research and Control Act of 1987	USCG	USCG is responsible for enforcing prohibitions on ocean waste dumping under the Marine Plastic Pollution Research and Control Act.
Marine Protection Research and Sanctuaries Act of 1972	EPA; NOAA; USCG	EPA and other coordinating agencies have authority under the Marine Protection Research and Sanctuaries Act and the Ocean Dumping Ban Act of 1988 to enforce the prohibition on the dumping of wastes from plastics and petrochemical refineries, as well as synthetic or natural plastic materials into the oceans.
Outer Continental Shelf Lands Act	DOI (BSEE)	The Outer Continental Shelf Lands Act authorizes DOI to ensure offshore energy companies comply with training, reporting, control, and removal requirements to minimize ocean disposal. The agency is responsible for ensuring that corrective action is taken in all cases where pollution has occurred either by the polluter or at the polluter's expense.
Rivers and Harbors Act of 1899	DOJ (enforcement authority)	DOJ—authorized to enforce the Rivers and Harbors Act under section 11 of the Act—can prosecute violators of section 13's prohibition against the discharge of refuse, which may include plastic or plastic waste, from any ship or floating craft into navigable waters or tributaries of navigable waters.

2. Reduce at-sea abandonment or discard of fishing gear

Abandoned and discarded fishing gear makes up the majority of large plastic pollution in the oceans.[51] To address this problem, the NASEM Report identifies several strategies, including establishing solid waste disposal infrastructure for end-of-life fishing nets and gear; creating incentives for land-based (e.g., dockside) disposal of end-of-life fishing nets, gear, and trash; and establishing identification and/or tagging for deployed active and passive fishing nets and pots. The following federal authorities have provisions that help reduce at-sea abandonment or discard of fishing gear.

[51] *See, e.g.,* Sandra Laville, *Dumped fishing gear is biggest plastic polluter in ocean, finds report*, THE GUARDIAN (Nov. 5, 2019), https://www.theguardian.com/environment/2019/nov/06/dumped-fishing-gear-is-biggest-plastic-polluter-in-ocean-finds-report.

Authorities to Minimize Ocean Disposal

Strategy: Reduce at-sea abandonment or discard of fishing gear

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Endangered Species Act; Marine Mammal Protection Act	NOAA; FWS	The Endangered Species Act and Marine Mammal Protection Act are limited in their ability to directly reduce plastic pollution. However, they are strong authorities for regulating how plastic pollution impacts species and habitat. The laws can force federal agencies to consider the impact of existing plastic pollution on a species' survival, and agencies could incorporate plastic removal as part of a species' recovery plan.
Marine Debris Act	NOAA	NOAA's Marine Debris Program supports several international coordination efforts designed to minimize ocean disposal. This includes efforts specifically designed to reduce at-sea abandonment of fishing gear, like the Global Ghost Gear Initiative and the Global Partnership on Marine Litter.
Marine Plastic Pollution Research and Control Act of 1987	USCG	USCG is responsible for enforcing prohibitions on ocean waste dumping under the Marine Plastic Pollution Research and Control Act.
Marine Protection Research and Sanctuaries Act of 1972	EPA; NOAA; USCG	EPA and other coordinating agencies have authority under the Marine Protection Research and Sanctuaries Act and the Ocean Dumping Ban Act of 1988 to enforce the prohibition on the dumping of wastes from plastics and petrochemical refineries, as well as synthetic or natural plastic materials into the oceans.
Magnuson-Stevens Fishery Conservation and Management Act	NOAA	Under the Magnuson-Stevens Act, NOAA has the authority to "minimize to the extent practicable adverse effects on [essential fish habitat] caused by fishing." Through this authority, NOAA Fisheries can reduce-at sea abandonment of plastic by requiring

		local regulators to consider the effects of plastic pollution when crafting fishery management plans.

G. Other Activities (to Support the Interventions)

Additional activities that support and build upon the above interventions can also be pursued. There are many existing federal levers, particularly in the form of federal programs, that provide for activities such as:

- collecting information and data on plastics and plastic pollution;
- researching and developing methods to measure and address the harmful toxins associated with plastics and policies to advance a circular economy (including production, use, recycling, and waste management improvements); and
- educating government and agency implementers, industry representatives, and the public about ways to reduce plastic pollution.

1. Information/data collection

Types of activities that could be implemented under this strategy include coordinated tracking and monitoring systems; community-based monitoring; national and state economic data collection and field data collection; mandatory annual reports on plastic use inventories of public companies and government institutions; and requiring plastic producers to report plastic production on carbon equivalents (such as through EPA's authority to request information to evaluate statutory compliance).

Other Activities (to Support the Interventions)

Strategy: Information and data collection		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Emergency Planning and Community Right-to-Know Act	EPA	Under the Emergency Planning and Community Right-to-Know Act (EPCRA), plastics manufacturing facilities must report information on their use, storage, and disposal of toxic chemicals such as PFAS and plastic resins. These public disclosure requirements have incentivized plastics facilities to reduce their disposal or discharge of chemicals into the environment.

Endangered Species Act	USFWS; NOAA	The process for listing, delisting, and assessing the impacts of government activities on endangered species requires significant information and data collection on threats to endangered species, including threats from plastic pollution.
Food, Drug, and Cosmetic Act	FDA	The FDA has authority to collect data on all food contacting substances on the market, which could allow more easier identification the substances that should be prioritized for post-market review.
Marine Debris Act	NOAA	NOAA's Marine Debris Program authorizes various research and data collection activities.
Marine Mammal Protection Act	NOAA; FWS	The process for assessing the impacts of government activities on marine mammals requires significant information and data collection on threats to endangered species, including threats from plastic pollution.
Public Health Service Act of 1944, amended by the Health Research Extension Act of 1985; & various environmental laws (e.g., CERCLA)	CDC; ATSDR; NIEHS	Agencies within the Department of Health and Human Services collect information and data as well as conduct research related to the human health effects of plastics. The Agency for Toxic Substances and Disease Registry (ASTDR), Centers for Disease Control and Prevention (CDC), EPA, and other state and federal entities can work collaboratively under ATSDR's enabling authority to "establish and maintain inventory of literature, research, and studies on the health effects of toxic substances." This authority has been and may continue to be used to research exposure risks to human health from microplastic and communicate the findings broadly. ATSDR holds a joint office of the Director with the National Center for Environmental Health and carries out the health-related provisions of environmental laws like CERCLA, RCRA and others. CDC's National Center for Environmental Health conducts laboratory research to improve the rapid and accurate detection of chemical threats and selected toxins. It also operates the National Biomonitoring Program that detects these in human tissue and publishes fact sheets on their health impacts.

		National Institute of Environmental Health Sciences (NIEHS) research focuses on discovering how the environment affects people to prevent diseases and improve human health.
Pollution Prevention Act	EPA	The Pollution Prevention (P2) Act authorizes the EPA to compile and share information on management, technical, and operational approaches to source reduction with state and local partners.
Toxic Substances Control Act	EPA	Using its authority under the Toxic Substances Control Act section 8, EPA can collect and publicize information from chemical manufacturers and processors regarding chemicals used in plastic production. The information collected can include data on the general environmental and health effects of plastic chemicals and specific "adverse reactions" to the environment or human health the chemical may cause.
Save Our Seas 2.0 Act of 2020	EPA	Under the Save Our Seas 2.0 Act, EPA has established a National Recycling Goal of achieving a 50 percent recycling rate by 2030. While the National Recycling Goal has no legal effect, it includes additional metrics for the EPA to use to track progress toward the national goal and compile data on U.S. recycling capabilities.

2. Research and development

Types of activities that could be supported by research and development include methods to deliver products without packaging; creation of industrially compostable and home compostable polymers, films, and adhesives; product design that maximizes circularity and recyclability; circular materials management and leakage characterization to inform upstream interventions; and intersectional and interdisciplinary research to prevent litter and illegal dumping.

The federal government's existing authorities to advance research and development in plastic pollution are sufficient to foster the whole-of-government approach recommended in the NASEM report. These authorities include the Consumer Product Safety Improvement Act; Strategy for Plastics Innovation; Environmental Research, Development, and Demonstration Authorization Act; Marine Debris Program; National Science Foundation Act; National Science and Technology Policy, Organization, and Priorities Act; and Small Business Development Act, which could be employed to better coordinate and prioritize research and development as well as monitoring and tracking activities.

Other Activities (to Support the Interventions)

Strategy: Research and development		
Statutory Authority	**Implementing Agency**	**Summary of Potential Intervention**
Consumer Product Safety Improvement Act	CPSC	CPSC has authority to fund and lead research efforts that examine human health risks from exposure to plastic and plastic products.
Energy Independence and Security Act of 2007; Energy Research and Innovation Act of 2018	DOE	DOE leads the Strategy for Plastics Innovation, a federal effort that "spans the full research, development, and deployment spectrum to address key challenges that limit plastic recycling."
Environmental Research, Development, and Demonstration Authorization Act of 1978	EPA	Using its general research mandates under the Environmental Research, Development, and Demonstration Authorization Act of 1978, as well as other federal pollution control statutes, EPA can continue to conduct research that seeks to standardize methods for microplastic collection, extraction, and identification in surface water and sediments through programs housed under and funded through the Office of Research and Development.
Federal Grant and Cooperative Agreement Act	DOE	DOE's general grant awarding authority may be leveraged to fund a variety of plastics material research and development efforts, such as projects that improve material recyclability.
Marine Debris Act (enacting the Marine Debris Program), Save Our Seas Act of 2018, and Save Our Seas 2.0 Act of 2020	NOAA	NOAA's Marine Debris Program authorizes various research and data collection activities.

National Insitute of Standards and Technology Act	NIST	The research programs and projects concerning plastics carried out by NIST are vital to efforts to reduce plastic pollution at all stages of the plastic life cycle—from production practices and polymer compounds, to recyclability, microplastic and nanoplastic detection, circular economy efforts, etc.
National Science Foundation Act of 1950	NSF	NSF has authority to award funding to interdisciplinary research and education projects that seek to address plastic pollution and marine debris.
National Science and Technology Policy, Organization, and Priorities Act of 1976	OSTP	Under the authority of the National Science and Technology Policy, Organization, and Priorities Act of 1976, the OSTP and National Science and Technology Council can coordinate federal research efforts on aspects of the plastic pollution issue relevant to science and technology policy, such as the development of plastic alternatives.
Occupational Safety and Health Act	OSHA	Using its general research mandates under the Occupational Safety and Health Act, the National Institute for Occupational Safety and Health (NIOSH) can study the risk microplastics and nanoplastics pose to worker safety in the plastic manufacturing industry.
Pollution Prevention Act	EPA	The Pollution Prevention (P2) Act authorizes the EPA to identify opportunities for further research and development into source reduction technologies.
Small Business Development Act of 1982	EPA	EPA can continue to fund research and demonstrations of technologies that seek to address plastic pollution—specifically the collection, quantification, and characterization of microplastics—through its SBIR Program awards.
Sustainable Chemistry Research and Development Act	OSTP	The Sustainable Chemistry Research and Development Act directs federal agencies participating in the corresponding interagency working group to “carry out activities in support of sustainable chemistry” such as supporting research, spreading information, expanding education, and incentivizing actions.

3. Education and outreach

Types of activities that could be implemented under this strategy include professional outreach, co-production of knowledge to inform solutions at local and regional scales; outreach on efficacy of plastic recycling, labeling, etc. and public engagement solutions development; information sharing through media, school materials, aquaria, and museums; public behavior-change campaigns; and community outreach to identify and address local barriers to prevent litter, illegal dumping, etc.

Other Activities (to Support the Interventions)

Strategy: Education and outreach

Statutory Authority	Implementing Agency	Summary of Potential Intervention
Consumer Product Safety Improvement Act	CPSC	The Consumer Product Safety Commission has existing authority to issue public safety warnings for various product hazards.
Executive Order 14096	All federal agencies	Under Executive Order 14096, federal agencies must consider what steps they need to take to hold public meetings about toxic chemical releases, which may conceivably arise from facilities in the plastic industry. These educational meetings may help to accomplish one purpose of the Executive Order: promoting meaningful engagement for communities with environmental justice concerns.
Outer Continental Shelf Lands Act	DOI	DOI's Marine Trash and Debris Program specifically requires offshore energy industry operators to conduct annual training for employees and follow best practices to reduce marine debris.
Marine Debris Act	NOAA	NOAA's Marine Debris Program authorizes various education and outreach activities.
National Park Service Organic Act of 1916 and National Park Service General	NPS	The National Park Service works with local, state, and other federal partners (such as NOAA's Marine Debris Program) on beach cleanups and educational products and programs to help inform park visitors of the environmental impacts of plastics pollution and marine debris.

Authorities Act of 1970		
Pollution Prevention Act	EPA	The Pollution Prevention (P2) Act authorizes the EPA to mount outreach and education efforts to further the adoption of source reduction technologies among states, local governments, and businesses.
Resource Conservation and Recovery Act	EPA	Launched by EPA's Office of Resource Conservation Recovery, the Waste Reduction Model—a digital tool that can be used as a software program or downloadable excel sheet—allows users to compare baseline waste management practices and several different alternatives for a given waste stream (based on user-inputted data). Companion tools, such as the Recycled Content tool and the Policy and Program Impact Estimator, can be used to illustrate the effects of plastics in the waste stream and to compare the various waste management options for plastics.

IV. EXISTING FEDERAL AUTHORITIES TO ADDRESS PLASTIC POLLUTION

Reducing plastic pollution and addressing the complex and evolving environmental and human health impacts associated with the production, use, and disposal of plastics will require innovative and progressive action. While more comprehensive and directed laws and regulations will be needed to address the plastic pollution crisis, the United States is already able to—or already regulating—plastics in a variety of ways. The following section details existing federal laws and programs with authority to regulate plastics (organized by the federal agency with primary implementing authority), explains the interventions to which the authorities apply, identifies gaps where applicable, and suggests ways that the existing authorities may be exercised to address plastic pollution.

This section begins by identifying authorities held by the Executive Office of the President that can spur interagency or "whole-of-government" actions to address plastic pollution. Next, this section lays out specific statutory authorities held by individual federal agencies. The authorities of each federal agency are discussed statute-by-statute. Where possible, the report lists the authorities with the greatest potential to mitigate plastic pollution first.

While the interventions provide useful guidance for addressing plastic pollution, the full force of the authorities may extend beyond the scope of the interventions and can be exercised in any way that helps tackle the problems associated with plastic pollution.

A. Executive Office of the President

Various offices in the Executive Office of the President (referred to as the White House) have specific legal and statutory authority to establish, manage and coordinate domestic policy and budget priorities. These powers offer a whole-of-government mechanism to bring to bear various activities across federal agencies to achieve Administration priorities. These include control over expenditures and procurement and meeting high level environmental as well as science and technology priorities. Thus, the Office of Management and Budget, the Council on Environmental Quality and the Office of Science and Technology Policy have authorities to direct the federal agencies to coordinate and undertake activities to meet Administration policy goals. Mechanisms for are varied, but can include executive orders, Presidential or White House office memoranda, establishment of standing committees, and budget allocation. Thus, the Executive Office possesses many tools to bring an integrated plan of action together to achieve the stated goal of eliminating plastic pollution in the environment by 2040. While these activities may be carried out by specific agencies or groups of agencies the coordinating and prioritization function is critical. Many activities are already underway, as noted below, and could be strengthened.

1. Office of Management and Budget

a. Federal Acquisition Regulation

The federal government spends between $650 and $700 billion on products and services each year.[52] Given this level of purchasing power, government procurement decisions can influence market trends through their direct market impact, by supporting emerging supply chains for innovative products, and by helping innovative products achieve economies of scale. Accordingly, the NASEM report listed government procurement rules that favor reusable products as a standalone strategy for decreasing plastic waste generation.

Most federal procurement decisions are subject to the Federal Acquisition Regulation (FAR). This regulation is the result of a 1979 statute directing the Office of Management and Budget's Office of Federal Procurement Policy "to issue polic[ies] . . . for the purpose of promoting the development and implementation of [a] uniform procurement system."[53] The FAR addresses most aspects of the procurement process, including rules and guidelines for long-term procurement planning, contract formation, and contract management.[54] The FAR is implemented by the federal government's three primary procurement agencies, the Department of Defense (DOD), National Aeronautics and Space Agency (NASA), and General Services Administration (GSA), the latter of which controls procurement for most agencies in the federal government.[55] These three agencies, working with the Federal Acquisition Regulatory Council, can amend FAR to issue new rules and policy priorities for the federal procurement system.[56]

In addition to rules and requirements surrounding procurement practices (i.e., contracts must be awarded through competitive bidding processes), FAR amendments can also further public policies as set by Congress or the President.[57] For example, FAR amendments have long mandated procurement agencies must provide small and veteran-owned businesses "maximum practicable opportunities" to earn government contracts and subcontracts.[58]

While FAR contains general rules for the federal procurement system, it is not the only source of authority governing procurement. Statutes, agency-specific FAR supplements, other agency

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[52] Nichola Groom, *U.S. Will Consider Limiting Plastics in Federal Purchasing,* REUTERS (Jul. 7, 2022), https://www.reuters.com/world/us/us-will-consider-limiting-plastics-federal-purchasing-2022-07-06/; Fact Sheet, The White House, Biden-Harris Administration Announces New Better Contracting Initiative to Save Billions Annually (Nov. 8, 2023), https://www.whitehouse.gov/omb/briefing-room/2023/11/08/fact-sheet-biden-harris-administration-announces-new-better-contracting-initiative-to-save-billions-annually/.
[53] ERIKA K. LUNDER ET AL., CONG. RESEARCH SERV., R42826, THE FEDERAL ACQUISITION REGULATION (FAR): ANSWERS TO FREQUENTLY ASKED QUESTIONS 2 (Dec. 18, 2015) [hereinafter CONG. RESEARCH SERV., R42826], https://crsreports.congress.gov/product/pdf/R/R42826.
[54] *Id.*
[55] *Id.*
[56] *See, e.g.*, 87 Fed. Reg. 54,937 (Sept. 8, 2022).
[57] 48 C.F.R. § 1.102-2(a)–(d).
[58] 48 C.F.R. § 19.201.

regulations, and guidance documents may also give individual agencies authority to issue procurement policies.[59]

The Biden-Harris Administration has taken significant steps to bolster sustainability practices in its procurement policies. For example, the Administration released Executive Order 14057 on using federal procurement to advance clean energy and sustainability goals in 2021,[60] and it more recently issued proposed amendments to the FAR for prioritizing sustainable products in its procurement practices.[61] Separately, some federal agencies (most notably the Department of the Interior) have issued their own procurement policies against single-use plastics.[62] The subsections below detail these interventions and how they might be expanded upon.

i. Executive Order 14057 on Federal Sustainability
(President Joseph R. Biden Jr.; all federal agencies, especially the General Services Administration)

In 2021, the Biden-Harris Administration issued Executive Order 14057 (EO 14057) on catalyzing American clean energy industries and jobs through federal sustainability. The EO's accompanying Federal Sustainability Plan sets out a range of ambitious goals to deliver emissions reductions.[63] The strategy will be accomplished partly through increasing government purchases of sustainable products and services, including plastic alternatives.[64] The EO also directs federal agencies to minimize waste and support recycled products and a circular economy.[65] In furtherance of section 207 of EO 14057, the White House's Office of Management and Budget has directed agencies "to take actions to reduce and phase out procurement of single-use plastic products."[66]

Individual agencies are implementing the EO's directive on waste reduction and supporting markets for recycled products. For example, in Secretary's Order 3407 (SO 3407), Secretary Haaland ordered

[59] CONG. RESEARCH SERV., R42826, *supra* note 533.
[60] Fact Sheet, The White House, President Biden Signs Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability (Dec. 8, 2021) [hereinafter *Fact Sheet: EO 14057*], https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/08/fact-sheet-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/ (explaining, in part, the Biden-Harris Administration's goal of "net-zero emissions from federal procurement no later than 2050, including a Buy Clean Policy to promote use of construction materials with lower embodied emissions").
[61] Federal Acquisition Regulation, 88 Fed. Reg. 51,672 (Aug. 4, 2023) (to be codified at 48 C.F.R. pts. 1, 52).
[62] *Secretary Haaland Issues Order to Phase Out Single-Use Plastics, Protect Public Lands and Waters*, U.S. DEPT. OF THE INTERIOR (Jun. 8, 2022), https://www.doi.gov/pressreleases/secretary-haaland-issues-order-phase-out-single-use-plastics-protect-public-lands-0.
[63] *Fact Sheet: EO 14057*, *supra* note 60.
[64] Mark Segal, *Biden Administration Announces New Sustainable Procurement Rules for Federal Government*, ESGTODAY (Aug. 2, 2023), https://www.esgtoday.com/biden-administration-announces-new-sustainable-procurement-rules-for-federal-government/.
[65] Executive Order 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, 86 Fed. Reg. 70,935 (Dec. 13, 2021).
[66] Ocean Conservancy, Comment on National Draft Strategy to Prevent Plastic Pollution, EPA-HQ-OLEM-2023-0228 (July 31, 2023) [hereinafter Ocean Conservancy Plastic Pollution Comments], https://www.regulations.gov/comment/EPA-HQ-OLEM-2023-0228-0239.

the Department of the Interior to reduce the procurement, sale and distribution of single-use plastic products and packaging with a goal of phasing out single-use plastic products on Department-managed lands by 2032.[67] Implementing SO 3407, the U.S. Fish and Wildlife Service has devised a department-wide approach to reducing plastic pollution.[68] The National Park Service also published its Plastics Elimination and Reduction Plan, which aims to eliminate single-use plastic and implement plastics reduction strategies across the agency and the areas it manages.[69] EO 14057 empowers other federal agencies beyond the Department of the Interior to similarly reduce the procurement, sale, and distribution of single-use plastic products.

In August 2023, the Biden-Harris Administration took a significant step in implementing EO 14057 by releasing a proposed Sustainable Products and Services Rule. The new rule would amend the FAR to direct federal procurement agencies (namely the GSA, DOD, and NASA) to prioritize sustainable products and services "to the maximum extent practicable."[70] The proposed rule would specifically direct procuring agencies to follow the EPA's Recommendations for Specifications, Standards, and Ecolabels for Federal Purchasing (explained in more detail below), which provides sustainability guidance for 34 different purchase categories.[71]

Separately, in December 2023, the GSA issued a proposed rule in compliance with EO 14057 to reduce single-use plastics in packaging and shipping products under GSA contracts.[72] The proposed rule would amend the General Service Administration Acquisition Regulations (GSAR), the GSA's specific procurement regulations that implement and supplement the FAR.[73] GSA's proposed rule would define single-use plastics in packaging, encourage GSA's contractors and industry partners to promote their single-use plastic free packaging products with an icon, and encourage GSA's

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[67] *Secretary Haaland Issues Order to Phase Out Single-Use Plastics, Protect Public Lands and Waters,* U.S. DEP'T INTERIOR (Jun. 8, 2022), https://www.doi.gov/pressreleases/secretary-haaland-issues-order-phase-out-single-use-plastics-protect-public-lands-0; s*ee also* Sec. Order No. 3407, U.S. DEPT. OF INTERIOR (Jun. 8, 2022), https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3407.pdf.

[68] *Reducing Single-Use Plastic Pollution*, U.S. FISH & WILDLIFE SERV., https://www.doi.gov/reducing-single-use-plastic-pollution (last visited Mar. 14, 2024).

[69] U.S. NAT'L PARK SERVICE, PLASTIC ELIMINATION AND REDUCTION PLAN 2 (June 2023), https://www.nps.gov/subjects/sustainability/upload/Plastics-Elimination-and-Reduction-Plan_2023-2.pdf.

[70] Federal Acquisition Regulation, 88 Fed. Reg. 51,672 (Aug. 4, 2023) (to be codified at 48 C.F.R. pts. 1, 52).

[71] *Biden-Harris Administration Announces Plan to Maximize Purchases of Sustainable Products and Services as Part of the Presidents Investing in American Agenda,* THE WHITE HOUSE (Aug. 1, 2023), https://www.whitehouse.gov/ceq/news-updates/2023/08/01/biden-harris-administration-announces-plan-to-maximize-purchases-of-sustainable-products-and-services-as-part-of-the-presidents-investing-in-america-agenda/#:~:text=The%20Sustainable%20Products%20and%20Services%20procurement%20rule%2C%20a,products%20and%20services%20to%20the%20maximum%20extent%20possible.

[72] General Services Administration Acquisition Regulation; Reduction of Single-Use Plastic Packaging, 88 Fed. Reg. 88,856 (Dec. 26, 2023) (to be codified at 48 C.F.R. pts 502, 538, and 552).

[73] 48 C.F.R. § 501.301 ("GSA's implementation and supplementation of the Federal Acquisition Regulation (FAR) is issued in the GSAM, which includes the GSAR. The GSAM is under authorization and subject to the authority, direction, and control of the SPE. The GSAR contains acquisition policies and procedures that have a significant effect beyond the internal operating procedures of GSA or a significant cost or administrative impact on contractors or offerors").

customer agencies to consider selecting the single-use plastic free packaging options.[74] The GSA's rule explicitly states it "is incentivizing the use of [single-use plastics] free packaging, as defined by the agency, not mandating it."[75] The public comment period for GSA's proposed rule ended on February 26, 2024.

How the FAR and Executive Order 14057 may be applied to Intervention 3, decrease waste generation through mandatory procurement rules favoring reusable products:
In furtherance of section 207 of EO 14057, OMB has directed agencies to take actions to reduce and phase out procurement of single-use plastic products. Some agencies, such as DOI and its subagencies, have taken steps to implement EO 14057. However, the order empowers all federal agencies to similarly take steps to reduce the procurement, sale, and distribution of single-use plastic products. The Biden-Harris Administration has also taken a potentially significant step in implementing EO 14057 by releasing a proposed Sustainable Products and Services Rule. If finalized, the new rule would amend the FAR to direct federal procurement agencies (namely the GSA, DOD, and NASA) to prioritize sustainable products and services "to the maximum extent practicable."[76] Finally, in compliance with EO 14057, the GSA is considering a new regulation to reduce single-use plastics in packaging and shipping of products. EPA could consider working with GSA throughout the ongoing rulemaking process "to support a [] plan to phase out single-use plastic and packaging . . . consistent with the May 2023 recommendations of the GSA Acquisition Policy Federal Advisory Committee."[77] The other principal federal procurement agencies, DOD and NASA, could consider a regulation similar to the GSA's to reduce single-use plastics in packaging and shipping.

ii. EPA's Environmentally Preferable Purchasing Program
(Environmental Protection Agency)

One policy contained within the FAR requires agencies to "maximize the utilization of environmentally preferable products and services (based on EPA-issued guidance)."[78] In furtherance of this policy, and specifically the directive to "maximize the utilization of environmentally preferable *products,*" EPA has developed 'Recommendations of Specifications, Standards, and Ecolabels for Federal Purchasing' [(Recommendations)] across several key purchase categories."[79]

[74] General Services Administration Acquisition Regulation; Reduction of Single-Use Plastic Packaging, 88 Fed. Reg. at 88,857.
[75] *Id.* at 88,858.
[76] Federal Acquisition Regulation, 88 Fed. Reg. 51,672 (Aug. 4, 2023) (to be codified at 48 C.F.R. pts. 1, 52).
[77] Ocean Conservancy Plastic Pollution Comments, *supra* note 666, at 6 (citing *GSA Acquisition Policy Federal Advisory Committee (GAP FAC)*, GEN. SERVS. ADMIN. 26 (Spring 2023)).
[78] 48 C.F.R. § 23.703(b)(1).
[79] *Sustainable Marketplace: Greener Products and Services, Recommendations: Frequent Questions*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/greenerproducts/recommendations-frequent-questions (last visited Mar. 14, 2024) (EPA notes that the other authorities that guide the Recommendations include: EOs

The Recommendations are a component of a larger EPA program, the Environmentally Preferrable Purchasing (EPP) Program, that "helps U.S. federal government purchasers utilize private sector standards and ecolabels to identify and procure environmentally preferrable products and services, providing a convenient and streamlined way to make sense of the often-complex sustainable products marketplace."[80]

The Recommendations do not represent an EPA endorsement of standards or ecolabels of any products. Rather, the Recommendations indicate that the given standard or ecolabel meets either another federal agency's recommended use or the EPA's "Framework for the Assessment of Environmental Performance Standards and Ecolabels for Federal Purchasing [Framework]." This Framework was developed by EPA and the GSA, among other federal agencies, pursuant to then-EO 13514, which, among other things, required federal agencies to "reduce waste; support sustainable communities; and leverage [f]ederal purchasing power to promote environmentally-responsible products and technologies."[81] EPA may consider updating its EPP to help facilitate the phasing out of single-use plastics, consonant with its Draft National Strategy to Prevent Plastic Pollution.

How the FAR and EPA's Environmentally Preferable Purchasing Program may be applied to Intervention 3, decrease waste generation through mandatory procurement rules favoring reusable products:
EPA's EPP program and Recommendations of Specifications, Standards, and Ecolabels for Federal Purchasing, in furtherance of the FAR requirement to maximize utilization of environmentally preferable services, "helps U.S. federal government purchasers utilize private sector standards and ecolabels to identify and procure environmentally preferrable products and services." [82] EPA can consider updating its EPP program—namely through expansions to the Recommendations—to help "facilitate the phasing out of single-use plastics."[83] EPA can also consider engaging in cross-agency collaboration to "provide guidance to vendors and suppliers on how to comply with the updates to the EPP."[84]

14008, 14030, 14057; the Federal Sustainability Plan; IIJA; IRA; Pollution Prevention Act of 1990, section 6604(b)(11); and the National Technological Transfer and Advancement Act, section 12d).

[80] *About the Environmentally Preferable Purchasing Program*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/greenerproducts/about-environmentally-preferable-purchasing-program (last visited Mar. 14, 2024).

[81] Exec. Order No. 13514, 74 Fed. Reg. 52,117 (2009) (revoked by EO 13693 (2013)).

[82] *About the Environmentally Preferable Purchasing Program*, *supra* note 80.

[83] Ocean Conservancy Plastic Pollution Comments, *supra* note 666.

[84] *Id*.

2. Council on Environmental Quality

a. Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All
(all federal agencies)

On April 21, 2023, President Biden issued Executive Order 14096 (EO 14096),[85] which aims to embed environmental justice into the work of federal agencies and to better protect overburdened communities from pollution and environmental harms. It directs federal agencies to review their programs, policies, and activities to identify and address disproportionate barriers, hazards, and negative outcomes they may create for overburdened communities. EO 14096 establishes the White House Environmental Justice Interagency Council and the White House Office of Environmental Justice within the CEQ.[86] Notably, EO 14096 instructs agencies to ensure meaningful engagement with communities, alert communities in a timely manner about toxic chemical releases, and submit Environmental Justice Strategic Plans (EJ Strategic Plans) to the Chair of the Council on Environmental Quality (CEQ) every four years.

The EJ Strategic plans should set forth the agency's vision, goals, priority actions, and metrics to address and advance environmental justice and to fulfill the directives of this order, including through the identification of new staffing, policies, regulations, or guidance documents."[87] Pursuant to the EO, CEQ was directed to issue interim guidance in October 2023 that agencies can use to develop their EJ Strategic Plans.[88] Appended to this guidance is an "internal checklist" CEQ created for federal agencies as they move to consider each charge in the EO" as it applies to the agency's work and mission.[89] Among other "checklist" items is the guiding question, "what steps could the agency consider taking to ensure timely information for the public, including communities with environmental justice concerns, about toxic chemical releases?"[90]

The EO's charge regarding community notification on toxic chemical releases directs agencies to consult EPA guidance on sections 301 through 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) in addition to considering "what planning steps are needed to hold public meetings" that provide community members with the information required under section 304(b)(2) of EPCRA (e.g., nature of the release, known or anticipated health risks, and the proper precautions to take as a result of the release).

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[85] *FACT SHEET: President Biden Signs Executive Order to Revitalize Our Nation's Commitment to Environmental Justice for All*, THE WHITE HOUSE, https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/21/fact-sheet-president-biden-signs-executive-order-to-revitalize-our-nations-commitment-to-environmental-justice-for-all/#:~:text=The%20IPC%20will%20coordinate%20federal,communities%20%E2%80%93%20are%20available%20to%20all. (last visited Mar. 19, 2024).
[86] Exec. Order No. 14096, 88 Fed. Reg. 25,251 (2023).
[87] *Id.* at 25,256.
[88] *Id*.
[89] WHITE HOUSE COUNCIL ON ENVTL. QUAL., STRATEGIC PLANNING TO ADVANCE ENVIRONMENTAL JUSTICE UNDER EXECUTIVE ORDER 14096, REVITALIZING OUR NATION'S COMMITMENT TO ENVIRONMENTAL JUSTICE FOR ALL 13 (Oct. 2023).
[90] *Id*. at 14.

As of the date of this report, agencies' EJ Strategic Plans have not yet become due. It is conceivable, however, that agencies may document how they plan to ensure that timely information about toxic chemical releases is provided to the public. As detailed later in this report,[91] EPCRA is relevant to plastics regulation because it mandates disclosures from plastic facilities on how they store, process, use, and handle hazardous chemicals inherent in plastic production (e.g., polyethelene, polypropylene, and the PFAS chemical group). The EO's requirement for federal agencies to hold timely public meetings on toxic chemical releases supports a government-wide approach to education and outreach, specifically regarding public dissemination on hazardous pollution for communities, including but not limited to, those with environmental justice concerns.

How Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All, may support the interventions through education and outreach:
Executive Order 14096 charges federal agencies to develop and make publicly available Environmental Justice Strategic Plans. A component of these plans should address the agency's plan to ensure that communities, especially communities with environmental justice concerns, have timely information about toxic chemical releases. Toxic chemical releases may occur at facilities in the plastic industry. Public meetings that widely disseminate relevant information about such releases serve as an important community education lever about pollution related to plastic production.

b. National Environmental Policy Act

The National Environmental Policy Act (NEPA) applies to all federal agencies and guidance on implementation of NEPA is coordinated by the Council on Environmental Quality (CEQ). However, NEPA requirements attach to all federal actions. For more information on EPA implementation of NEPA, see the Environmental Protection Agency section below.[92]

c. National Defense Authorization Act for Fiscal Year 2021 (Ocean Policy Committee: Council on Environmental Quality; Office of Science and Technology Policy)

Though the Ocean Policy Committee (OPC) was originally established by Executive Order 13840,[93] its responsibilities were codified by section 1055 of the National Defense Authorization Act for Fiscal Year 2021 through the reauthorization of the National Oceanographic Partnership Program (NOPP). Section 1055 directs the OPC to coordinate federal actions on ocean-related matters and oversee the implementation of the NOPP.[94] The Ocean Policy Committee is co-chaired by the

[91] *See infra* ELI Report on Existing U.S. Federal Authorities to Reduce Plastic Pollution: A Synopsis for Decision Makers, at Section IV(B)(8) [hereinafter ELI Report].
[92] *See infra* ELI Report, at Section IV(B)(6)(a)(i).
[93] Exec. Order No. 13840, 83 Fed. Reg. 25,251 (2023).
[94] National Defense Authorization Act for Fiscal Year 2021, H.R. 6395, 116th Cong. § 1055(a).

Director of the Office of Science and Technology Policy (OSTP) and the Chair of the Council on Environmental Quality (CEQ), as prescribed by Executive Order 13840.[95]

i. Ocean Justice Strategy

At COP28, the Chair of the White House Council on Environmental Quality, Brenda Mallory, announced the release of the Biden-Harris Administration's Ocean Justice Strategy (Strategy), which was a product of the OPC.[96] Though not an official executive order, the Strategy builds upon the directives set out in:

- Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All;
- Executive Order 14008, Tackling the Climate Crisis at Home and Abroad;
- Executive Order 14091, Further Advancing Racial Equity and Support for Underserved Communities Through the Federal Government; and
- Executive Order 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government.[97]

The Strategy also expands the reach of the Ocean Climate Action Plan of March 2023, and will be used to develop the forthcoming National Strategy for a Sustainable Ocean Economy.[98] This initiative describes "overarching goals, principles, and practices that the Federal Government can take to provide long-term, sustainable benefits for people, communities, and the environment." It also seeks to improve "Federal Government processes, workforce development, capacity building, and the production and advancement of knowledge to better address injustice faced by coastal and ocean-dependent communities."[99]

The Strategy has three major goals: (1) embed ocean justice in federal activities; (2) develop a diverse, equitable, inclusive, and accessible federal ocean workforce; and (3) enhance ocean justice through education, data, and knowledge. It also compiles tools, such as the Social Vulnerability Index, that agencies can use to understand social and environmental justice patterns and track ocean justice indicators.[100]

How the Ocean Justice Strategy may be applied to Intervention 5, capture waste by removing plastic wastes from ocean wildlife and habitats:

[95] Exec. Order No. 13840, 83 Fed. Reg. 25,251 (2023).
[96] *Biden-Harris Administration Unveils First-Ever Strategy to Advance Environmental Justice for Communities That Rely on the Ocean and Marine Resources,* THE WHITE HOUSE (Dec. 8, 2023), https://www.whitehouse.gov/ceq/news-updates/2023/12/08/biden-harris-administration-unveils-first-ever-strategy-to-advance-environmental-justice-for-communities-that-rely-on-the-ocean-and-marine-resources/.
[97] *See generally* EXEC. OFF. OF THE PRESIDENT, OCEAN POL'Y COMM., OCEAN JUSTICE STRATEGY (Dec. 2023).
[98] 88 Fed. Reg. 42,111 (June 29, 2023).
[99] *Id*.
[100] *Id*.

The Introduction section of the Ocean Justice Strategy states that "the Strategy is motivated by the recognition that many communities that live near the ocean, depend on marine resources, or are part of the ocean economy face unique circumstances that exacerbate existing challenges. These circumstances prevent many communities from sharing equitably in the benefits the ocean provides. Some communities are disproportionately burdened by the negative outcomes of human activities in and around the ocean, such as coastal flooding, pollution, and overfishing . . . [and] may be disproportionately affected by ocean-related health and environmental harms and hazards." Therefore, the Ocean Policy Committee may guide federal agencies to take action on marine plastic pollution, as the effects of marine plastic pollution on ocean ecosystems, ocean resources, and coastal communities disproportionately affect historically marginalized communities.

3. Office of Science and Technology Policy

a. Sustainable Chemistry Research and Development Act

The Sustainable Chemistry Research and Development Act was enacted as part of the National Defense Authorization Act (NDAA) for Fiscal Year 2021, Title II, Subtitle E.[101] The bipartisan initiative seeks to promote sustainable chemistry (also called "green chemistry") in the United States through the creation of an interagency working group, co-chaired by the Office of Science and Technology Policy (OSTP) Director and representatives from the EPA, National Institute of Standards and Technology, National Science Foundation, and Department of Energy.[102]

Subtitle E tasks the working group with creating a strategic plan for sustainable chemistry, which includes developing a consensus definition of sustainable chemistry, coordinating federal research and support, and identifying scientific barriers. It also directs the working group to identify federal regulatory barriers to and opportunities for facilitating sustainable chemistry use. In addition, Subtitle E encourages participating agencies to facilitate partnerships with and among various institutions, from the private sector to higher education.[103]

The agencies participating in the working group must "carry out activities in support of sustainable chemistry" through supporting research, spreading information, expanding education, and incentivizing actions, including through national awards programs called the Green Chemistry Challenge.[104] EPA's Green Chemistry Challenge promotes green chemistry innovation by recognizing "chemical technologies that incorporate the principles of green chemistry into chemical design,

[101] National Defense Authorization Act (NDAA) for Fiscal Year 2021, Pub. L. No. 116-283, 134 Stat. 3497 (2021); *Sustainable Chemistry Research and Development Act Passed as Part of National Defense Authorization Act,* NAT'L L. REV. (Jan. 2021), https://www.natlawreview.com/article/sustainable-chemistry-research-and-development-act-passed-part-national-defense.
[102] *Sustainable Chemistry Research and Development Act Passed as Part of National Defense Authorization Act,* NAT'L L. REV. (Jan. 2021), https://www.natlawreview.com/article/sustainable-chemistry-research-and-development-act-passed-part-national-defense.
[103] 15 U.S.C. §§ 9301–9305 (2021).
[104] *Id.*

manufacture, and use."[105] In addition to the challenge, EPA conducts its own research and funds academic research related to green chemistry,[106] which it defines as "the design of chemical products and processes that reduce or eliminate the generation of hazardous substances." EPA also defines "[g]reen chemistry [as] appli[cable] across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal."[107]

How the Sustainable Chemistry Research and Development Act may be applied to Intervention 2, innovation of material and product design through enforceable product standards for manufacturers:
The interagency working group enabled by the Sustainable Chemistry Research and Development Act, as well as the EPA's Green Chemistry program, may be able to work towards using definitions, frameworks, partnerships, funding, and activities relating to sustainable/green chemistry to address plastic pollution through product standards and/or innovation in material and design, if plastic (or types of plastic, such as microplastics/nanoplastics) can be encapsulated into the definition of a chemical product which generates hazardous substances or itself, constitutes a hazardous substance.

How the Sustainable Chemistry Research and Development Act may be applied to Intervention 3, decrease waste generation through extended producer responsibility requirements (end-of-life management):
The EPA's definition of green chemistry[108] specifically applies across the life cycle of a product, which could extend producer responsibility requirements for plastics.

How the Sustainable Chemistry Research and Development Act may support research and development:
The Sustainable Chemistry Research and Development Act directs federal agencies participating in the corresponding interagency working group to "carry out activities in support of sustainable chemistry" such as supporting research, spreading information, expanding education, and incentivizing actions.

b. National Science and Technology Policy, Organization, and Priorities Act

[105] *Information About the Green Chemistry Challenge,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/greenchemistry/information-about-green-chemistry-challenge (last visited Mar. 14, 2024).
[106] *Green Chemistry,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/greenchemistry/ (last visited Mar. 14, 2024).
[107] *Basics of Green Chemistry*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/greenchemistry/basics-green-chemistry#definition (last visited Mar. 14, 2024).
[108] *Id*.

The National Science and Technology Policy, Organization, and Priorities Act of 1976 established the White House's OSTP.[109] Housed in the Executive Office of the President, OSTP's primary function is to provide "advice on the scientific, engineering, and technological aspects of issues that require attention at the highest level of Government."[110] The National Science and Technology Policy, Organization, and Priorities Act specifically authorizes OSTP to advise the President on science and technology issues relevant to the environment and conservation,[111] and two of OSTP's six "Teams" are devoted to climate and energy issues.[112] While OSTP has no regulatory authority, it plays important roles in setting White House policy on science and technology issues, assisting the Office of Management and Budget (OMB) in advising the White House on budget priorities related to science and technology, and facilitating interagency coordination on science and technology programs.[113]

When coordinating federal policies and programs, the OSTP often acts through the National Science and Technology Council (NSTC)—an interagency committee chaired by OSTP and composed of representatives from departments and agencies with science and technology responsibilities across the federal government.[114] The NSTC was established by Executive Order 12881 to create a cabinet-level group of science and technology advisors for the President.[115] The NSTC coordinates interagency science and technology policy-making processes, integrates the President's science and technology policy agenda across the Federal Government, and furthers international science and technology cooperation.[116]

The National Science and Technology Policy, Organization, and Priorities Act gives OSTP broad authority to advise the President on science and technology issues it deems important enough to "require attention at the highest level of Government."[117] In practice, however, the President and Congress usually prompt OSTP and NSTC's actions through legislation, executive orders, and

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[109] 42 U.S.C. § 6611 (the Act also created two other scientific advisory bodies in the Executive Branch: the President's Council of Advisors on Science and Technology and the Federal Coordinating Council for Science, Engineering, and Technology. The Reagan Administration abolished these agencies and transferred their responsibilities to the President under Reorg. Plan No. 1 of 1977. *See* Exec. Order No. 12039, 43 F.R. 8095, (Feb. 24, 1978)).

[110] 42 U.S.C. § 6613.

[111] *Id*. ("the Director shall . . . (1) advise the President of scientific and technological considerations involved in areas of national concern including, but not limited to, the economy, national security, health, foreign relations, the environment, and the technological recovery and use of resources.").

[112] *Office of Science and Technology Policy,* THE WHITE HOUSE, https://www.whitehouse.gov/ostp/ (last visited Mar. 14, 2024).

[113] JOHN F. SARGENT & DANA A. SHEA, CONG. RESEARCH SERV., R43935, OFFICE OF SCIENCE AND TECHNOLOGY POLICY (OSTP): HISTORY AND OVERVIEW (2020).

[114] JASON A. GALLO ET AL., CONG. RESEARCH SERV., R47653, THE WHITE HOUSE OFFICE OF SCIENCE AND TECHNOLOGY POLICY: ISSUES AND OPTIONS FOR THE 118TH CONGRESS (2023).

[115] Exec. Order No. 12881, Establishment of the National Science and Technology Council, 58 Fed. Reg. 62,491 (1993).

[116] *National Science and Technology Council*, THE WHITE HOUSE, https://www.whitehouse.gov/ostp/ostps-teams/nstc/ (last visited Mar. 14, 2024).

[117] 42 U.S.C. § 6613.

presidential memorandums.[118] Congressional or presidential directives have prompted many of OSTP and NTSC's actions on plastics and plastic-adjacent issues. For example, in response to Executive Order 14081 on "Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy," the OSTP and NTSC released a series of reports on biomanufacturing and bio-based plastic alternatives in March 2023.[119] The OSTP also set a goal for the United States to replace 90 percent of fossil fuel-based plastics with bio-based alternatives within twenty years.[120] Similarly, Congress directed OSTP to create an Interagency Working Group to coordinate Federal research on PFAS in the National Defense Authorization Act for Fiscal Year 2021. In response, in 2023 the OSTP and NSTC published a "state of the science report" on PFAS research that identified gaps and opportunities the federal government could address.[121]

Finally, as Congress mandated in the 21st Century Nanotechnology Research and Development Act, the NSTC has implemented the National Nanotechnology Initiative (NNI) to guide federal research into nanotechnology.[122] Among many other activities, the NNI monitors federal research in microplastics and nanoplastics.[123] The coordinating office within NNI also frequently holds public webinars to disseminate relevant information on a variety of topics about the status of nanotechnology research. Of note, NNI held a two-part webinar series in early 2023 that provided an overview of federal government activities addressing micro- and nanoplastics issues, focusing on regulatory agency collaboration and the work of relevant research agencies.[124] In this webinar, the Food and Drug Administration (FDA) communicated its agency-wide programmatic efforts to study the issue of microplastics and nanoplastics in food groups. This type of work involves literature reviews of exposure pathways, microplastics reported in food and beverages, and polymers reported in drinking water, seafood, milk, salt, and tea.[125]

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[118] For example, report language in the Consolidated Appropriations Act of 2022 directed the OSTP to develop a five-year plan for research on rapid climate intervention techniques. *See* OFF. OF SCIENCE AND TECH. POLICY, CONGRESSIONALLY MANDATED RESEARCH PLAN AND AN INITIAL RESEARCH GOVERNANCE FRAMEWORK RELATED TO SOLAR RADIATION MODIFICATION (2023), https://www.whitehouse.gov/wp-content/uploads/2023/06/Congressionally-Mandated-Report-on-Solar-Radiation-Modification.pdf.

[119] OFF. OF SCIENCE AND TECH. POLICY, BOLD GOALS FOR U.S. BIOTECHNOLOGY AND BIOMANUFACTURING: HARNESSING RESEARCH AND DEVELOPMENT TO FURTHER SOCIETAL GOALS (Mar. 2023); NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, VISION NEEDS, AND PROPOSED ACTIONS FOR DATA FOR THE BIOECONOMY INITIATIVE (Dec. 2023); OFF. OF SCIENCE AND TECH. POLICY, BUILDING THE BIOWORKFORCE OF THE FUTURE (Jun. 2023).

[120] BOLD GOALS FOR U.S. BIOTECHNOLOGY AND BIOMANUFACTURING, *supra* note 119, at 2.

[121] JOINT SUBCOMMITTEE ON ENVIRONMENT, INNOVATION, PUBLIC HEALTH, PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) REPORT (2023).

[122] 15 U.S.C. § 7501; *National Nanotechnology Initiative*, NAT'L NANOTECHOLOGY INITIATIVE, https://www.nano.gov/national-nanotechnology-initiative (last visited Mar. 14, 2024).

[123] Lynn L. Bergeson et al., *NNI Announces Webinars on U.S. Government Activities Addressing Micro- and Nanoplastic Issues*, NAT'L L. REVIEW (May 2023), https://www.natlawreview.com/article/nni-announces-webinars-us-government-activities-addressing-micro-and-nanoplastic.

[124] *See NNCO Public Webinars*, NAT'L NANOTECHNOLOGY INITIATIVE, https://www.nano.gov/PublicWebinars (last visited Mar. 14, 2024).

[125] NNI Public Webinar: Overview of U.S. Government Activities Addressing Micro- and Nanoplastics Issues, Session 2: Regulatory/Collaborations, Slides 29–45 (June 6, 2023) (available at https://www.nano.gov/sites/default/files/June6_23_nanoplastics_webinar_master_LR%20(1).pdf).

These OSTP and NTSC efforts demonstrate how the offices can coordinate and advance research and development into a wide range of plastics topics that support the reduction of plastic pollution in the United States.

How the National Science and Technology Policy, Organization, and Priorities Act of 1976 may support the interventions through research and development activities:
Under the authority of the National Science and Technology Policy, Organization, and Priorities Act of 1976, the OSTP and NSTC can coordinate federal research efforts on aspects of the plastic pollution issue relevant to science and technology policy, such as the development of "safe and sustainable" plastic alternatives. Member agencies of the NSTC's National Nanotechnology Initiative have initiated relevant data tracking related to micro and nanoplastics. Participating health agencies have identified knowledge gaps in detection, measurement, and understanding of micro and nanoplastics' implications for human health. As identified by the FDA on behalf of the Micro and Nanoplastics in Food Group, however, more work needs to be done to, among other things, establish standard definitions and fit-for-purpose metrics and standardized detection methods; and develop a better understanding of dosimetry and potential toxicity to humans.

B. Environmental Protection Agency

As the agency responsible for the administration of many of the major U.S. environmental laws and regulations, the U.S. Environmental Protection Agency (EPA) is the primary federal agency with the authority to act to reduce plastic pollution across its life cycle and curb its impacts on human health and the environment. Laws administered by EPA govern the prevention, control, and management of the release of pollutants, wastes, and hazardous substances to air, water, and soil to protect human health and the environment.

The following authorities to reduce plastic pollution are primarily administered by the EPA. Given the breadth of authority held by EPA, the strongest regulatory authorities are listed in intervention order, to the extent practicable. While EPA issued a "Draft National Strategy to Prevent Plastic Pollution" in 2023 for public comment, it has not yet issued a final strategy document. EPA recognized several authorities listed here but incorporating further authority identified in this report could strengthen both the strategy and an action plan. Also, EPA possesses key research authorities under its environmental statutes that could be employed to update health protective criteria and regulatory standards in line with scientific information now available on the potential risks and impacts of plastics and microplastics.

1. Clean Air Act

The Clean Air Act (CAA) mandates that EPA set emissions limits sufficiently stringent to protect public health and welfare from harmful air pollutants. These limits must reflect technological and work process advances to ensure that emissions are controlled to the maximum extent

practicable.[126] EPA has the authority to update the National Ambient Air Quality Standards to include microplastic particles. The agency may also update the New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants that apply to petrochemical production facilities and plastic production facilities, as well as consider microplastic particle emissions from small area sources that do not trigger minor or major stationary source CAA permitting. Though there have been significant increases in plastic production and pollution, as well as advancements in monitoring and control technologies, some of these standards have not been updated for decades.[127] Further, EPA may use its section 309(a) review authority to help other federal agencies identify and reduce potential adverse impacts of plastic manufacturing and production, industrial plastic use, or other plastic-related actions.

a. National Ambient Air Quality Standards (NAAQS)

The CAA requires EPA to set National Ambient Air Quality Standards (NAAQS) for six principal pollutants ("criteria air pollutants"), which can be harmful to public health and the environment.[128] The act identifies two types of national ambient air quality standards. "Primary standards" provide public health protection, including the protection of the health of "sensitive" populations such as asthmatics, children, and the elderly.[129] "Secondary standards" provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.[130]

Periodically, the standards are reviewed and sometimes may be revised, which can result in the establishment of new standards.[131] As of the date of this report, the most recently established standards regulate carbon monoxide (CO), lead (Pb), Nitrogen Dioxide (NO_2), Ozone (O_3), particulate matter or particle pollution (PM) (divided into categories $PM_{2.5}$ and PM_{10}), and sulfur dioxide (SO_2).[132] In some areas of the United States, certain regulatory requirements may also remain for implementation of previously established standards.[133]

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[126] *See* 42 U.S.C. §§ 7411(b)(1)(A), 7412(f)(2)(A), 7412(d)(2).
[127] *See, e.g.*, Center for Biological Diversity et al., Petition to the U.S. Environmental Protection Agency to Revise the Clean Air Act Section 111 and Section 112 Standards Applicable to Petro-Plastics Production Facilities 5 (Dec. 3, 2019) [hereinafter CBD CAA Petition], https://lpdd.org/resources/petition-to-revise-clean-air-act-111-112-standards-on-petro-plastic-production/ ("[For example:] the NSPS for emissions limits for the synthetic organic chemical manufacturing industry ("SOCMI") distillation operations and reactor processes have not been updated since 1990 and 1993, respectively, and the NSPS for emissions limits for the polymer manufacturing industry have not been updated since 2000. The NESHAP for fugitive emissions of benzene have not been updated since 1984, and NESHAP for general fugitive emissions from pumps, compressors, pressure relief devices, sampling connecting systems, and open-ended valves have not been updated since 2000.").
[128] *See* National Primary and Secondary Ambient Air Quality Standards, 40 C.F.R. pt. 50.
[129] *Id*.; *NAAQS Table*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/criteria-air-pollutants/naaqs-table (last visited Mar. 14, 2024).
[130] *Id*.
[131] NAAQS Table, *supra* note 129.
[132] *Id*.
[133] *Id*.

$PM_{2.5}$ is defined as fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller; and PM_{10} is defined as inhalable particles, with diameters that are generally 10 micrometers and smaller.[134] These particles vary in size and shape and can consist of hundreds of different chemicals.[135] "Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires. Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries, and automobiles."[136]

PM contains microscopic solids or liquid droplets, the sizes of which can be inhaled and create risks of serious health problems.[137] Some particles less than 10 micrometers in diameter can harm human health through introduction into lungs and bloodstreams.[138] Of these, particles less than 2.5 micrometers in diameter, also known as fine particles or $PM_{2.5}$, pose the greatest risk to human health.[139]

EPA could update the NAAQS to consider the unique toxicities of microplastic as part of the $PM_{2.5}$ criteria pollutant. This could include expanded consideration of the sources and types of $PM_{2.5}$ to include particles of microplastic; updating the $PM_{2.5}$ risk assessment to include the specific toxicities of microplastic; developing enhanced sampling and monitoring techniques capable of collecting and characterizing very small particles below 1.0 micrometers; and including microplastic particles in sampling, monitoring, and $PM_{2.5}$ assessment procedures as particles per cubic centimeter (rather than simply part of the ug/m3 mass of already speciated and considered $PM_{2.5,}$ which currently includes neither microplastic nor tire shred).[140]

How the NAAQS may be applied to Intervention 1, reduce plastic production and pollution from production through regulation of production capacity and associated pollution:
Updating the NAAQS under the CAA to include microplastic particles under the $PM_{2.5}$ criteria pollutant would provide for the regulation and further assessment of the environmental and human health risks associated with microplastic particles. Inclusion in the NAAQS would also allow for the scope of regulation to include and extend beyond the scope of source pollution from plastic production facilities to the other varies sources of microplastic particle pollution.

[134] *Particulate Matter (PM) Basics*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/pm-pollution/particulate-matter-pm-basics (last visited Jan. 8, 2024).
[135] *Id*.
[136] *Id*.
[137] *Id*.
[138] *Id*.
[139] *Id*.
[140] *See generally* Mary Ellen Ternes et al., Comment on Draft National Strategy to Prevent Plastic Pollution, EPA 330-R-23-006 (July 31, 2023) [hereinafter Mary Ellen Ternes et al. Plastics Pollution Comment], https://www.regulations.gov/comment/EPA-HQ-OLEM-2023-0228-0189. Only the Prevention of Significant Deterioration for particulate $PM_{2.5}$ would actually limit the emissions of plastic. Ultra fine particle pollution could also be considered for nanoplastic (e.g., PM $_{0.1}$); given the smaller the plastic particle is, the more harmful it may be. *Id*. at 29.

b. New Source Performance Standards (NSPS)

Section 111 of the CAA requires EPA to develop technology-based standards restricting criteria pollutant emissions from specific categories of stationary sources, referred to as New Source Performance Standards (NSPS). EPA defines NSPS as:

> a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.[141]

This level of control is sometimes referred to as best demonstrated technology (BDT) or the best system of emission reduction (BSER).

The NSPS process begins when EPA publishes a list of categories of stationary sources that cause or contribute significantly to air pollution.[142] EPA must then enact regulations establishing federal emissions limitations (or equipment specifications) for the industrial categories or subcategories of sources.[143] EPA must review and, if appropriate, revise these standards of performance every eight years.[144] States must submit to EPA a plan for implementing and enforcing the EPA-designated NSPS within their jurisdictions.[145] A source is subject to the NSPS if its construction or modification commenced after the publication of the proposed applicable NSPS.[146]

Under section 111, EPA has significant discretion to identify the facilities within a source category that should be regulated.[147] To define the affected facilities, EPA can use size thresholds and create subcategories based on source type, class, or size. EPA may also establish emission limits either for an entire facility or for equipment within a facility.

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[141] 42 U.S.C. § 7411(a)(1).
[142] 42 U.S.C. § 7411(b).
[143] 42 U.S.C. § 7411(b)(1)(B).
[144] 42 U.S.C. § 7411(b)(1)(B).
[145] 42 U.S.C. § 7411(c).
[146] 42 U.S.C. §§ 7411(a)(2), (b)(1)(B).
[147] EPA could specifically consider each categories' potential to emit microplastic and extend NSPS to ground level microplastic releases considered as a subset of $PM_{2.5}$. Further, a new category for NSPS could be identified as plastic production and recycling facilities (any portion of the plastic production and post-use plastic management process) that generate extreme emissions of microplastic pollution through loading, unloading, shredding, storage—as newly recognized $PM_{2.5}$ subcategory of criteria pollutant. *See* Mary Ellen Ternes et al. Plastics Pollution Comment, *supra* note 140, at 13.

The NSPS apply to new, modified, and reconstructed affected facilities[148] in specific source categories such as manufacturing of glass, cement, and certain plastics.[149]

Further, some existing NSPS apply to petrochemical and plastics production facilities. Many of these are within the "synthetic organic chemical manufacturing industry" category or the "polymer manufacturing industry" category.[150] The following table identifies some of these standards.

Table 1: NSPS that apply to petrochemical and plastics production facilities.[151]

Code Provision	Standards	Implicated Processes
40 C.F.R. Part 60, Subpart Db	Standards for SO_2, PM, and NOx emissions from natural-gas fired boilers	Natural-Gas Fired Boilers
40 C.F.R. Part 60, Subpart Kb	Standards for VOC emissions from storage vessels	Ethylene Manufacturing Process Unit Thermal Oxidizers Storage Tanks—high vapor pressure products
40 C.F.R. Part 60, Subpart VVa	Standards for VOC emissions from SOCMI equipment leaks	Ethylene Manufacturing Process Unit Fugitive Equipment and Process Leaks Loading operations (railcar and truck) – high vapor pressure
40 C.F.R. Part 60, Subpart NNN	Standards for VOC emissions from SOCMI distillation operations	Ethylene Manufacturing Process Unit Thermal Oxidizer Flare (ground/stack)
40 C.F.R. Part 60, Subpart RRR	Standards for VOC emissions from SOCMI reactor processes	Ethylene Manufacturing Process Unit Thermal Oxidizer Flare (ground/stack)
40 C.F.R. Part 60, Subpart DDD	Standards for VOC emissions from the polymer manufacturing industry	HDPE/LDPE/LLDPE Manufacturing Unit Thermal Oxidizer
40 C.F.R. Part 60, Subpart IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines	Emergency Pumps and Generators

[148] Affected facility is defined as "with reference to a stationary source, any apparatus to which a standard is applicable." 40 C.F.R. § 60.2.

[149] *See, e.g.,* Fact Sheet, U.S. Envtl. Prot. Agency, New Source Performance Standards Review for Surface Coating of Plastic Parts for Business Machines – Final Rule (2023), https://www.epa.gov/system/files/documents/2023-03/FactSheet_BusinessMachines_Final.pdf (last visited Mar. 14, 2024) (standards for surface coating of plastic parts for business machines); *Clean Air Act Standards and Guidelines for Foam, Fiber, Plastic, and Rubber Products*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/stationary-sources-air-pollution/clean-air-act-standards-and-guidelines-foam-fiber-plastic-and (last visited Mar. 14, 2024) (standards for reinforced plastic composite production).

[150] CBD CAA Petition, *supra* note 127, at 25.

[151] *Id.*; *see also New Source Performance Standards*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/stationary-sources-air-pollution/new-source-performance-standards (last visited Mar. 13, 2024) (listing all NSPS).

Notably, some of these standards are out of date and do not reflect BSER. Given that health, environmental, and climate impacts, as well as environmental justice impacts, of plastics production have significantly increased, and control and process equipment technology has improved over time, EPA has the responsibility to update these standards to reflect the best systems of emission controls available.

Further, should EPA update its NSPS authority (regarding criteria pollutant sources), with the updated NAAQS, then the updated NSPS can also set specific limits on $PM_{2.5}$ that is microplastic. For example, NSPS Subpart DDDD, for solid waste incinerators, allows high emissions of $PM_{2.5}$ from stacks and does not consider fugitive emissions.[152] Currently Subpart DDDD—which governs those facilities that would both handle and burn large quantities of plastic—is not implemented to control microplastic released from waste management activities at ground level, nor does it speciate $PM_{2.5}$ that is microplastic and that is allowed to be emitted through the combustion stack. This gap in regulations can result in the release of significant amounts of microplastic into the environment.

How the NSPS may be applied to Intervention 1, reduce plastic production and pollution from production through regulation of production capacity and associated pollution:

The CAA authorizes EPA to regulate air pollution from petrochemical and plastic production facilities. Specifically, EPA has the authority and is required to update and promulgate new NSPS and NESHAP (discussed below) to protect human health and the environment.

Under section 111, EPA can update existing NSPS that apply to facilities involved in the production and management of plastics. EPA may also list additional production and management facilities (currently unlisted) as source categories and subsequently promulgate NSPS for the source categories.[153] For example, it has been suggested that ethylene (already listed under section 112), propylene, polyethylene, and polypropylene production facilities be listed as they are stationary sources that emit air pollution that endangers public health and welfare.[154] For these updated facilities, EPA could include emission standards for both ground level as well as stack emissions of microplastic as a specific type of $PM_{2.5}$ with unique harm (following NAAQS development for this source and type of $PM_{2.5}$).

Further, should EPA update its NSPS authority (regarding criteria pollutant sources), with the updated NAAQS, then the updated NSPS can also set specific limits on $PM_{2.5}$ that is microplastic.

c. National Emission Standards for Hazardous Air Pollutants (NESHAP)

In addition to regulating emissions of common pollutants from new sources, EPA controls emissions of hazardous air pollutants (HAPs) from new or modified and existing sources through the National

[152] *See generally* 40 C.F.R. pt. 60, subpt. DDDD.
[153] 42 U.S.C. § 7411(b)(1)(B).
[154] *See* CBD CAA Petition, *supra* note 127, at 30.

Emission Standards for Hazardous Air Pollutants (NESHAP).[155] Under the NESHAP program, Congress and EPA have identified 187 substances as HAPs, which "are known to cause or may reasonably be anticipated to cause adverse effects to human health or adverse environmental effects."[156]

Section 112 of the CAA establishes a two-stage regulatory process to address emissions of HAPs from stationary sources. First, EPA must identify categories of sources emitting one or more of the HAPs listed in section 112(b).[157] Second, EPA must promulgate standards to control HAP emissions from the sources. The NESHAP program requires health-based standards that "provide an ample margin of safety to protect human health."[158] In addition, the 1990 CAA Amendments require a technology-based standard known as the Maximum Achievable Control Technology (MACT) standard, which applies to major sources (facilities with the potential to emit ten tons per year or more of any single HAP or 25 tons per year of any combination of HAPs).[159] The MACT must reflect

> the maximum degree of reduction in emissions of [HAPs] (including a prohibition on such emissions, where achievable) that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing sources in the category or subcategory to which such emission standard applies, through application of measures, processes, methods, systems or techniques.[160]

These standards must require the maximum degree of reduction that the EPA Administrator determines is achievable through measures, among others, which "reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications" or "enclose systems or processes to eliminate emissions."[161]

Every eight years, EPA must reevaluate technology-based standards based on MACT to determine whether additional standards are necessary to address any residual risks associated with HAPs emissions.[162] In addition, EPA must reassess standards set under Section 112 "no less often" than

[155] These standards are for pollutants not covered by the National Ambient Air Quality Standards (NAAQS).
[156] 42 U.S.C. § 7412(b)(3)(B); *Environments and Contaminants – Hazardous Air Pollutants*, ENVTL. PROT. AGENCY, https://www.epa.gov/americaschildrenenvironment/environments-and-contaminants-hazardous-air-pollutants (last visited Nov. 15, 2023).
[157] *See* CBD CAA Petition, *supra* note 127, at 26 (these categories and subcategories largely track those categories established under the NSPS standards but are not identical); *id*. (citing 40 U.S.C. § 7412(c)(1)) (EPA has identified over 120 such source categories); *id*. (citing *National Emission Standards for Hazardous Air Pollutants (NESHAP)*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/stationary-sources-air-pollution/national-emission-standards-hazardous-air-pollutants-neshap-9 (last visited Nov. 30, 2023)).
[158] 42 U.S.C. § 7412(f)(2)(A).
[159] *See* CBD CAA Petition, *supra* note 127, at 27.
[160] 42 U.S.C. § 7412(d)(2).
[161] 42 U.S.C. § 7412(d)(2)(A)–(B).
[162] 42 U.S.C. § 7412(f)(2)(C).

every eight years to determine if there are "developments in practices, processes, or control technologies" that may be appropriate to incorporate into the standards.[163]

Although the CAA mandates that EPA reassess NESHAP every eight years, many of the standards that apply to petrochemical and plastics production facilities have not been updated in decades. For example, the emissions standards governing fugitive emissions of benzene, have not been updated since 1984.[164] The emissions standards for fugitive emissions from pumps, compressors, pressure relief devices, sampling connecting systems, and open-ended valves have not been updated since 2000.[165] Further, emissions for new and existing reinforced plastic composite production facilities have not been updated since 2005.[166] Since that time there have been many technological and process advancements that NESHAP should reflect.

Additionally, EPA may utilize its NESHAP authority to identify new HAPs from the inventory of microplastic-producing sources that pose the most acute risk. EPA currently recognizes asbestos as a HAP based upon toxicity resulting from its sharp needle like particles. Microplastic may pose similar risks depending upon the type, and should be considered as a possible HAP.[167] Further, because NESHAP is generally triggered by much higher emission thresholds of ten tons per year of a single HAP, or 25 tons per year of combined HAP, EPA may create area source NESHAP for known sources of microplastic HAP.[168] Such sources would likely include mechanical plastic recyclers shredding plastic and producing ground level sources of sharply edged microplastic.[169] EPA has utilized area source NESHAP strategies for ubiquitous sources of smaller emissions of HAPs and ground level sources, such as dry-cleaning facilities. Plastic producers and recyclers are similar in ubiquity and are low ground level sources of toxic pollutants like some sharply edged microplastic particles. Thus, this area source NESHAP approach is familiar and could be applied in the same manner.

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[163] 41 U.S.C. § 7412(d)(6).

[164] *See generally* CBD CAA Petition, *supra* note 127, at 28 (citing National Emission Standards for Hazardous Air Pollutants; Benzene Equipment Leaks (Fugitive Emission Sources), 49 Fed. Reg. 23,513 (June 6, 1984)).

[165] *Id*. (citing Consolidated Federal Air Rule (CAR): Synthetic Organic Chemical Manufacturing Industry, 65 Fed. Reg. 78,268, 78,281 (Dec. 14, 2000)).

[166] National Emission Standards for Hazardous Air Pollutants: Reinforced Plastic Composites Production, 70 Fed. Reg. 50,118 (Aug. 25, 2005).

[167] *See, e.g.*, Simon Wieland et al., *From properties to toxicity: Comparing microplastics to other airborne microparticles*, 428 J. OF HAZARDOUS MATERIALS 128151 (2022) (discussing possible mechanisms of airborne microplastic toxicity by comparatively analyzing observed health effects and toxicology of other airborne microparticles, such as asbestos).

[168] *See* 42 U.S.C. § 7412(a)(1) ("The Administrator may establish a lesser quantity, or in the case of radionuclides different criteria, for a major source than that specified in the previous sentence, on the basis of the potency of the air pollutant, persistence, potential for bioaccumulation, other characteristics of the air pollutant, or other relevant factors.").

[169] *See, e.g.*, Allyson Chiu, *The little-known unintended consequence of recycling plastics*, WASH. POST (May 22, 2023, 6:00 a.m.), https://www.washingtonpost.com/climate-solutions/2023/05/22/plastic-recycling-microplastic-pollution/ (citing a peer-reviewed study of a recycling facility in the U.K. which suggests "that anywhere between 6 to 13 percent of the plastic processed could end up being release in to water or air as the microplastics . . .").

EPA has a responsibility to incorporate these developments into the NESHAP to address the risks faced by communities from benzene, microplastic, and other toxic emissions.

How the NESHAP may be applied to Intervention 1, reduce plastic production and pollution from production through regulation of production capacity and associated pollution:

The CAA authorizes EPA to regulate air pollution from petrochemical and plastic production facilities. Specifically, EPA has the authority and is required to update and promulgate new NSPS and NESHAP to protect human health and the environment.

The NESHAP require EPA to set standards for HAPs emission that "provide an ample margin of safety to protect public health."[170] EPA has the authority to update existing MACTs to ensure public health is thus protected. For example, EPA can update its Generic MACT for the ethylene production source category.[171] EPA can also set area-source NESHAP requirements for smaller sources of HAP emissions, to regulate emission of microplastic defined as HAP from the broader scope of manufacturing which utilizes plastic in production equipment and release fugitive emissions of microplastic during operation.

EPA also has the authority to ensure that any new petrochemical or plastic production facilities are equipped with the most stringent control technology to minimize HAPs emissions to non-detectable limits.

EPA can also minimize and/or eliminate malfunction, shutdown, and even force majeure exemptions that circumvent the purpose of the CAA.[172]

d. Section 309(a) Review Authority

Under section 309(a) of the CAA, the EPA Administrator is required to "review and comment in writing on the environmental impact of any matter relating to duties and responsibilities granted pursuant to the [CAA]" for other federal agencies' proposed major actions.[173] If EPA determines that any other federal action—legislation, newly authorized Federal projects for construction and major Federal agency actions under section 102(2)(C) of the National Environmental Policy Act (except construction projects), or proposed regulations—"is unsatisfactory from the standpoint of public health or welfare or environmental quality," EPA is directed to publish this determination and refer the matter to the Council on Environmental Quality.[174]

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[170] 42 U.S.C. § 7412(f)(2)(A).

[171] *See generally* 84 Fed. Reg. 54,278, 54,294 (Oct. 9, 2019); CBD CAA Petition, *supra* note 127, at 33 (discussing deficiencies in the MACT for the ethylene production source category and suggesting more robust review and risk analyses be conducted for HAPs).

[172] Due to climate change, "force majeure" events such as natural disasters are likely to become more common. EPA can require facilities to prepare for currently exempted events—by, for example, installing back-up power systems, fortifying their facilities, etc.—to avoid the pollution these events often cause.

[173] 42 U.S.C. § 7609(a).

[174] 42 U.S.C. § 7609(b).

EPA's section 309(a) review authority "is broad and provides an opportunity for EPA to ensure that cumulative impacts, factoring in the combined exposures to stressors in a community, are adequately disclosed and considered across hundreds of [Environmental Impact Statements] issued every year across the federal government."[175] The purpose of this process, as stated by EPA, is to use the agency's expertise to help other federal agencies in "identifying and reducing potential adverse impacts from the proposed action."[176]

EPA can view this authority as an agent of Intervention 1, production or manufacturing restrictions and limits, by working to ensure that other federal agencies adequately consider and address adverse impacts of plastic manufacturing and production. This might be most clearly seen in the consideration of the cumulative impacts of plastic production facilities, including environmental justice and climate concerns.

How the CAA section 309(a) review authority may be applied to reduce plastic production and pollution from production through regulation of production capacity and associated pollution:
EPA can continue to exercise the full range of its CAA section 309(a) authority to help other federal agencies fulfill their NEPA obligations in identifying and reducing potential adverse effects from proposed actions. This may become increasingly relevant to the permitting of petrochemical and plastic production and manufacturing facilities, including cumulative impacts of new facilities in areas already overburdened by environmental injustices and climate impacts.

2. Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) was enacted in 1976 to prevent unreasonable risks of injury to health or the environment associated with the manufacture, processing, distribution, use, or disposal of chemical substances.[177]

a. Key Features of TSCA Related to Plastics Regulation

Two of TSCA's foundational features make it particularly relevant to a potential plastics regulatory scheme. First, in addition to regulating disposal and management, TSCA fills a gap in U.S. environmental law by regulating chemical substances "upstream," or at the point of production and entering commerce.[178] By contrast, most other major environmental statutes (RCRA, CERCLA, CAA, and CWA) primarily regulate chemical substances "downstream" as waste products or when they otherwise enter the environment.[179] By regulating the chemical substances in plastics upstream, TSCA provides a more straightforward path to acting in early intervention areas such as regulating

[175] U.S. ENVTL. PROT. AGENCY OFF. GEN. COUNS., EPA LEGAL TOOLS TO ADVANCE ENVIRONMENTAL JUSTICE: CUMULATIVE IMPACTS ADDENDUM (Jan. 2023).
[176] U.S. ENVTL. PROT. AGENCY, POLICY AND PROCEDURES FOR THE REVIEW OF MAJOR FEDERAL ACTION WITH ENVIRONMENTAL IMPACTS 1 (Sept. 26, 2023) (available at https://www.epa.gov/system/files/documents/2023-09/309-nepa-policy-and-procedures-manual-9-26-23.pdf).
[177] STEVEN FERREY, ENVIRONMENTAL LAW 674 (8th ed. 2019) [hereinafter FERREY].
[178] *Id*. at 673–674.
[179] *Id*.

production, enforcing product standards, and decreasing waste generation. Second, TSCA is considered a catch-all pollution statute.[180] TSCA's jurisdictional reach is broad, encompassing any "chemical substance" or "mixture."[181] Therefore, when no other federal law regulates market access for a specific chemical substance (as is the case with plastics), the substance is typically within the jurisdiction of TSCA.[182]

However, there are some features of the law that complicate its potential use as the vehicle for addressing plastic pollution. The remainder of this section will describe how TSCA operates, its limitations, how EPA has used TSCA to regulate the plastics industry, and how EPA could expand those efforts.

b. Covered Substances and Classifications

TSCA provides EPA with "authority to require reporting, record-keeping, testing requirements, and restrictions relating to chemical substances and/or mixtures."[183] The law defines "chemical substance" as "any organic or inorganic substance of a particular molecular identity."[184] "Mixtures" are "any combination of two or more chemical substances if the combination does not occur in nature and is not . . . the result of a chemical reaction."[185] Practically speaking, the only substances outside of TSCA's purview are those explicitly regulated under other federal statutes, such as nuclear material under the Atomic Energy Act.[186] Therefore, the chemical substances and mixtures present in plastics are within TSCA's jurisdiction. TSCA may be particularly relevant for the substances used in plastic manufacturing and plastic additives (i.e., chemicals that make plastic products stronger, colorful, or fire resistant).

TSCA divides all chemical substances into two categories: (1) existing chemical substances and (2) new chemical substances. When Congress passed TSCA, it instructed EPA to create a list of all existing chemical substances manufactured and processed in the United States.[187] This list is called the TSCA "Chemical Substance Inventory."[188] All substances not listed in the inventory are considered new substances and are subject to premarket approval under TSCA section 5.[189] Significant new uses of existing chemicals are also subject to these restrictions under section 5.[190]

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[180] *Id*. at 675.
[181] *See* 15 U.S.C. § 2602(2) (defining chemical substance as "any organic or inorganic substance of a particular molecular identity"); 15 U.S.C. § 2602(10) (defining mixture as "any combination of two or more chemical substances if the combination does not occur in nature and is not, in whole or in part, the result of a chemical reaction").
[182] FERREY, *supra* note 177, at 675.
[183] *Summary of the Toxic Substances Control Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/laws-regulations/summary-toxic-substances-control-act (last visited Mar. 14, 2024).
[184] 15 U.S.C. § 2602(2)(A).
[185] 15 U.S.C. § 2602(10).
[186] FERREY, *supra* note 177, at 675.
[187] *TSCA Chemical Substance Inventory*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/tsca-inventory (last visited Mar. 14, 2024).
[188] *Id*.
[189] 15 U.S.C. § 2604(a)(1)(A)(i).
[190] 15 U.S.C. § 2604(a)(1)(A)(ii).

Existing chemicals, however, are regulated under TSCA section 6, for which there is no premarket approval requirement. Instead, in the section 6 context, EPA faces the burden of demonstrating the need for regulating existing chemicals.[191]

c. Regulating New Substances and Significant New Uses – TSCA Section 5

TSCA section 5(a) provides that no one may manufacture, import, or process a new substance unless they give EPA prior notice and EPA affirmatively determines the new substance is safe.[192] TSCA applies substantially the same rule to significant new uses of an existing substance.[193] This premanufacture notice requirement is a significant burden, requiring manufacturers to submit test data demonstrating the new substance's processing, distribution, use, and disposal will not present unreasonable risks of injury to health or the environment.[194] Prior to the 2016 TSCA amendments, the EPA only completed reviews for about 20 percent of new chemical substances.[195] In all other cases, the EPA "dropped" the chemical part way through its review and allowed it to go to market without an affirmative risk determination.[196] The 2016 TSCA amendments required EPA to abandon this system and make an affirmative risk determination on 100 percent of new chemical substances submitted to the Agency.[197] However, there are limitations on section 5(a)'s applicability to plastics.

First, some substances used in plastics are already listed in the Chemical Substance Inventory, rendering them "existing substances", and under the purview of section 6 rather than section 5.[198]

Second, in 1995, the EPA issued a regulation explicitly exempting new types of polymers, the central ingredient in plastics, from the premanufacture notification requirement. [199] The regulation's rationale is based on the premise that polymers are relatively stable, nontoxic in their

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[191] 15 U.S.C. § 2605.

[192] 15 U.S.C. § 2604(a)(1)(B).

[193] *See generally* 15 U.S.C. § 2604 (the EPA can also restrict or prohibit new uses of an existing (or new) chemical substance. TSCA Section 5(a)(2) authorizes EPA to require notice of any proposed new use of a chemical, including in an article, or category of articles, (manufactured in the U.S. or imported). EPA can then review the proposed new use to determine whether it poses an unreasonable risk to human health or the environment. If EPA determines that the new use poses an unreasonable risk, it can be regulated, using the same tools from section 6(a) described above. This authority is exercised by EPA issuing a Significant New Use Rule (SNUR). The notice required for EPA to review a proposed new use is a Significant New Use Notice (SNUN)).

[194] FERREY, *supra* note 177, at 680.

[195] *Statistics for the New Chemicals Review Program under TSCA*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/statistics-new-chemicals-review (last visited Mar. 14, 2024).

[196] *Id*.

[197] *Id*. However, the EPA's Inspector General has noted that without a requisite increasing in funding and staff to handle the added workload, the EPA has struggled to timely process new chemical substance submissions. *See*, U.S. ENVTL. PROT. AGENCY OFFICE OF INSPECTOR GENERAL, 23-P-0026, THE EPA LACKS COMPLETE GUIDANCE FOR THE NEW CHEMICALS PROGRAM TO ENSURE CONSISTENCY AND TRANSPARENCY IN DECISIONS, U.S. ENVTL. PROT. AGENCY (Aug. 2023) (available at https://www.epa.gov/system/files/documents/2023-08/_epaoig_20230802-23-P-0026.pdf).

[198] *See generally*, *TSCA Chemical Substance Inventory*, *supra* note 187.

[199] 40 C.F.R. § 723.250.

manufactured product condition, and do not typically bioaccumulate.[200] The exception also allows for new types of plastic to avoid appearing on the Chemical Substance Inventory and being subject to TSCA's Chemical Data Reporting rules (explained below).[201] According to some academic observers, the EPA's polymer rule has "effectively exempted most plastics from TSCA scrutiny."[202]

The EPA has made some exceptions to the polymer exemption. For example, in 2010, the EPA issued another regulation that excluded polymers containing as an integral part of their composition perfluoroalkyl sulfonates (PFAS) and perfluoroalkyl carboxylates (PFAC) from the polymer exemption.[203] In comments to the EPA Draft National Strategy to Prevent Plastic Pollution, some environmental groups called for the elimination of the polymer exemption altogether (which would require EPA to issue revised regulations).[204]

Third, section 5's language only extends to "new chemical substances" rather than "mixtures." This framing (sometimes referred to as the "mixture exemption") allows plastic manufacturers to develop new plastic compounds and plastic additive formulations without pre-market approval.[205] TSCA defines "mixture" as any combination of chemical substances so long as they do not produce a chemical reaction.[206] Plastic manufacturers often create new products by mixing in plastic additives without causing a chemical reaction, preventing the new product from being considered a separately regulated "new chemical substance."[207] Furthermore, this type of plastic compounding is not typically considered "manufacturing" under TSCA.[208] The result is the creation of products that have different chemical properties (such as becoming more resistant to degradation) without undergoing TSCA pre-market approval.

These three barriers to regulating new chemical substances under TSCA section 5 have not prevented the EPA from regulating significant new *uses* of plastics under the same authority. For example, the EPA recently relied on its TSCA section 5 authority to regulate "Significant New Uses"

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[200] Thomas Berger, Rhys Daniels, Matthew Harney, *A Practical Understanding of the Polymer Exemption*, KELLER & HECKMAN (2016), https://www.khlaw.com/insights/practical-understanding-polymer-exemption?language_content_entity=en.

[201] Earthjustice, Comments on U.S. Environmental Protection Agency's Draft National Strategy to Prevent Plastic Pollution, EPA-HQ-OLEM-2023-0228 35–36 (2023) [hereinafter Earthjustice Plastic Pollution Comments], https://earthjustice.org/wp-content/uploads/2023/11/2023.07.31-comments-on-draft-national-strategy-to-prevent-plastic-pollution.pdf.

[202] Robert Adler & Carina Wells, *Plastics and the Limits of U.S. Environmental Law*, 47 HAR. ENV'T. L. REV. 1, 45, (forthcoming 2024).

[203] 40 C.F.R. § 723.250 (d)(6).

[204] Earthjustice Plastic Pollution Comments, *supra* note 201, at 35–36.

[205] Mary Ellen Ternes, Compilation Memorandum regarding the GSCE Plastics Reports: France and the United States: Comparative Law Analysis and Recommendations Regarding Plastic Waste (Jan. 1, 2022) [hereinafter *Compilation Memorandum regarding the GSCE Plastics*], https://www.gcseglobal.org/sites/default/files/inline-files/GCSE%20French%20American%20Comparative%20Law%20of%20Plastic%20Pollution%20March%2015%202022.pdf.

[206] 15 U.S.C. § 2602(10).

[207] *Compilation Memorandum regarding the GSCE Plastics Reports*, *supra* note 205.

[208] *Id*.

of plastic waste used as feedstock for transportation fuels.[209] Specifically, in June 2023, the EPA proposed Significant New Use Rules (SNURS) that would require companies to obtain EPA approval before manufacturing or processing eighteen chemicals derived from plastic-waste feedstocks.[210] The purpose of the rule is to ensure the plastic-waste feedstocks do not contain potentially harmful impurities like PFAS, heavy metals, dioxins, bisphenols, and flame retardants.[211]

Still, the polymer exemption—paired with the mixture exemption and the fact that many chemical substances used in plastics are already in the Chemical Substance Inventory—pushes many hypothetical plastic regulations under TSCA to section 6, which governs the regulation of existing substances.

How section 5 of TSCA may be applied to Intervention 2, innovation of material and product design by setting enforceable product standards:
Although some plastics materials are currently exempt from the requirement by the "polymer exemption," under Section 5 manufacturers must demonstrate a new substance's processing, distribution, use, and disposal—or a significant new use of a previously listed chemicals—will not present unreasonable risks of injury to health or the environment. This requirement can amount to an enforceable product standard in the plastics industry. For example, the EPA has recently used its Section 5 authority to mandate pre-market approval before companies use plastic waste derived feedstock to manufacture certain chemicals used in transportation fuels.[212]

How section 5 of TSCA may be applied to Intervention 1, the reduction of plastic production and pollution from production through the restriction of certain problematic and unnecessary primary polymers, chemicals of concern, and pollution:
By repealing the regulatorily imposed "polymer exemption" from TSCA section 5's pre-market approval requirement, the EPA could ensure no new types of polymers could be manufactured without the agency's affirmation that they do not pose unreasonable risks to human health and the environment.

[209] *Rules for Chemicals Made from Plastic Waste-Based Feedstocks under the Toxic Substances Control Act: Rule Summary,* U.S. ENVTL. PROT. AGENCY (Jul. 19, 2023), https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/rules-chemicals-made-plastic-waste.
[210] Significant New Use Rules: Certain Chemical Substances (23-2.5e), 88 Fed. Reg. 39,804 (June 20, 2023).
[211] Lynn L. Bergeson and Carla N. Hutton, *EPA Will Propose SNURs for 18 Chemicals Made from Plastic Waste-Derived Feedstocks*, NAT'L L. REV. (Jun. 16, 2023), https://www.natlawreview.com/article/epa-will-propose-snurs-18-chemicals-made-plastic-waste-derived-feedstocks.
[212] *Rules for Chemicals Made from Plastic Waste-Based Feedstocks under the Toxic Substances Control Act: Rule Summary,* U.S. ENVTL. PROT. AGENCY (Jul. 19, 2023), https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/rules-chemicals-made-plastic-waste.

How section 5 of TSCA may be applied to Intervention 3, decreasing waste generation through plastic product bans:
Finally, section 5 of TSCA is also applicable to efforts to decrease waste generation by potentially preventing the commercialization of certain plastics and their harmful additives.

d. Regulating Existing Chemical Substances – TSCA Section 6

Under section 6, TSCA gives EPA authority to regulate existing chemicals or mixtures that present unreasonable risks to health or the environment.[213] The threshold for regulation is seemingly low. As the D.C. Circuit explained in a seminal TSCA case, "if the Administrator finds that there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture, or that any combination of such activities, presents or will present an unreasonable risk of injury to health or the environment, the Administrator shall by rule" regulate the substance through bans, restrictions, concentration limits, labeling requirements, or other authorized forms of regulation.[214] EPA has used this section 6 authorization to regulate substances related to plastics production such as polychlorinated biphenyls (PCBs) and methylene chloride.[215]

Before 2016, there was no statutorily prescribed system for how EPA would review existing chemicals. As a result, except for some of the most high-profile substances like asbestos, most existing chemicals escaped review.

One of the most significant aspects of Congress's 2016 TSCA reform bill was to create a mandatory schedule and prioritization system for EPA to review the over 70,000 existing chemical substances already in commerce.[216] The law directed EPA to develop criteria for designating existing chemical substances as high priority, which would mandate their review under section 6. At first, the law mandated EPA identify and begin reviewing ten high-priority substances within a year of enactment, then 20 more within three and a half years of enactment.[217] These statutorily prescribed schedules ended in 2021, and EPA now has discretion to continue "designat[ing] priority substances and conduct risk evaluations at a pace consistent with the ability of [the EPA] to complete risk evaluations [within three years from when the agency begins]."[218]

In December 2023, EPA announced it would use this section 6 authority to begin risk evaluations for five existing chemicals primarily used to make plastics. Over the next year, EPA will evaluate the risk

[213] 15 U.S.C. § 2605(a).
[214] Chemical Manufacturers Association v. U.S. Environment Protection Agency, 859 F.2d 977 (D.C. Cir. 1988).
[215] *Regulation of Chemicals Under Section 6(a) of the Toxic Substances Control Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/regulation-chemicals-under-section-6a-toxic-substances (last visited Mar. 14, 2024).
[216] Kevin Mclean, *Three Years After – Where Does Implementation of the Lautenberg Act Stand?*, HARVARD L. SCH. ENVTL. & ENERGY L. PROGRAM 21 (Feb. 2020), http://eelp.law.harvard.edu/wp-content/uploads/McLean-TSCA.pdf.
[217] 15 U.S.C. § 2605(b)(2)(A)–(B).
[218] 15 U.S.C. § 2605(b)(2)(C).

of the five chemicals to determine if they should be designated as "high priority substances" under section 6. For each chemical so designated, EPA will begin its roughly three-year-long formal risk evaluation, after which the chemicals could be banned or restricted if deemed unsafe.[219] These chemicals are acetaldehyde, acrylonitrile, benzenamine, 4.4 Methylenebis, and vinyl chloride.[220]

Another significant change made in the 2016 TSCA reform bill was the elimination of the mandate to consider costs and economic factors in determining whether a chemical substance presents an unreasonable risk to health or the environment.[221] Before the reform bill, section 6 was weakened by a strict requirement to consider economic costs and benefits in both determining what amounted to an "unreasonable risk" to human health and the environment, and in the EPA's choice of how to regulate a chemical substance. These standards resulted in decisions such as *Corrosion Proof Fittings v. EPA,* where the Fifth Circuit held that some economically useful substances, like asbestos, could not be banned outright.[222] The 2016 TSCA reform bill abandoned this standard and expressly dictated that EPA "shall not consider costs or other non-risk factors" when conducting risk evaluations.[223] Instead, TSCA now directs EPA to make determinations on risk based on:

- the likelihood of exposure under certain conditions of use,
- duration, intensity, frequency, and number of exposures under certain conditions of use, and
- the weight of the scientific evidence for the identified hazard and exposure.[224]

The precise process of risk evaluations is laid out in the EPA's Risk Evaluation Rule, which also directs the EPA to consult with other relevant federal agencies in the risk evaluation process.[225] Ultimately, if EPA finds the chemical substance presents an unreasonable risk of injury to health or the environment during this review, it must regulate the substance under section 6(a). Even if EPA can only conclude the substance *may* present an unreasonable risk of injury to human health the environment, it can put the substance on the section 5(b)(4) "Concern List." A listing on the Concern List would subject the substance to Export Notification requirements under section 12(b).[226]

Beyond specific chemicals used in plastic manufacturing or additives, TSCA may also provide authority to regulate plastic as plastic particles (or microplastics).[227] For example, the EPA issued its Asbestos Worker Protection Rule under its TSCA section 6 authority.[228] The rule regulates asbestos

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[219] Ellie Borst, *EPA Goes After Plastics With Chemicals Plan*, E&E NEWS (Dec. 14, 2023), https://www.eenews.net/articles/epa-goes-after-plastics-with-chemicals-plan/.
[220] *Id*.
[221] *Three Years After – Where Does Implementation of the Lautenberg Act Stand?, supra* note 216, at 13.
[222] *See* Corrasion Proof Fittings v. EPA, 947 F.2d 1201 (5th Cir. 1991).
[223] 15 U.S.C. § 2605(b)(F)(iii).
[224] 15 U.S.C. § 2605(b)(F).
[225] *See generally* 40 C.F.R. § 702 (2017); 40 C.F.R. § 702.39 (2017) ("During the risk evaluation process, not to preclude any additional, prior, or subsequent collaboration, EPA will consult with other relevant Federal agencies.").
[226] Nat. Res. Def. Council, Comment on National Draft Strategy to Prevent Plastic Pollution, EPA-HQ-OLEM-2023-0228 (July 31, 2023) [hereinafter NRDC Plastic Pollution Comments].
[227] Mary Ellen Ternes et al. Plastics Pollution Comment, *supra* note 140.
[228] 40 C.F.R. § 763.

in workplaces for government employees as an airborne particle—mandating no public sector employee may be exposed to airborne asbestos beyond a certain dose.[229] Some scientific literature identifies airborne microplastics as being similarly toxic to humans, especially through bioaccumulation,[230] which could theoretically open the door to TSCA regulation of plastic particles in a similar manner as asbestos particles.[231]

e. Barriers to TSCA Section 6 Authority – Section 4 Testing Requirements

A barrier to EPA's authority under section 6 lies in section 4, the section detailing the chemical testing requirements before a substance can be regulated under section 6.[232] Before EPA acts under section 6, section 4 provides that EPA has the burden of proving the initial need for forcing a manufacturer to test an existing substance for risks to health and the environment.[233] Section 4(a)(3) requires EPA to provide manufacturers a "statement of need" that identifies the need for new information on the chemical substance and the scientific basis for the Agency's inquiry.[234]

Before the 2016 TSCA reform, EPA had to establish this need for testing in formal notice and comment rulemaking, which made the process slow and costly.[235] In fact, during the first 18 years of TSCA's existence, EPA only issued 30 test rules (although EPA could also reach voluntary testing consent agreements with manufacturers).[236]

However, since the 2016 amendments were enacted, EPA has had authority to issue test "orders" in some instances (in addition to more formal rulemakings).[237] Issuing a test order involves fewer procedural hurdles than formal rulemaking, but EPA still estimates the process to issue a test order can "require 6 months or longer."[238]

f. Regulating Persistent and Bioaccumulative Substances

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[229] *Id.* (by adopting the same standard as OSHA' Asbestos Standards for Construction and General Industry for its Asbestos Worker Protection Rule, the EPA effectively regulates asbestos as an airborne particle under TSCA Section 6–mandating no employee may be exposed to airborne asbestos beyond "an airborne concentration of asbestos in excess of 1.0 cubic centimeter of air as averaged over a sampling period of thirty minutes." *See* 29 C.F.R. § 1910.1001(c)(1)).

[230] Simon Wieland et al., *From properties to toxicity: Comparing microplastics to other airborne microparticles,* 428 J. OF HAZARDOUS MATERIALS 128151 (April 2022).

[231] Mary Ellen Ternes et al. Plastics Pollution Comment, *supra* note 140 ("use of MP reference dose to adopt new TSCA regulation addressing MP as EPA did with asbestos, in the Asbestos Worker Protection Rule, 40 C.F.R. Part 763, Subpart G, regarding brake linings").

[232] *See* 15 U.S.C. § 2603(a)(2).

[233] FERREY, *supra* note 177, at 676; 15 U.S.C. § 2603(a)(2).

[234] 15 U.S.C. § 2603(a)(3); *Overview on Activities Involved in Issuing a TSCA Section 4 Order,* U.S. ENVTL. PROT. AGENCY (Mar. 24, 2022) [hereinafter *Overview on Activities Involved in Issuing a TSCA Section 4 Order*].

[235] FERREY, *supra* note 177, at 676.

[236] *Id.*

[237] *Overview on Activities Involved in Issuing a TSCA Section 4 Order, supra* note 2344.

[238] *Id.*

TSCA section 6(h) provided a one-time exception from these testing and risk evaluation requirements for regulating certain persistent, bioaccumulative, and toxic substances.[239] Passed as a part of the 2016 TSCA reform bill, section 6(h) directed the EPA to regulate the specific chemical substances previously identified in the EPA's 2014 TSCA Work Plan for Chemical Assessments without conducting full risk evaluations.[240] These chemical substances included some involved in plastics such as: (1) decabromodiphenyl ether, a flame retardant used in plastic electronics such as televisions, computers, audio and video equipment, and (2) phenol, isopropylated phosphate, a plasticizer used in various industrial coatings, adhesives, sealants, and plastic articles.[241] In 2021, the EPA finalized rules implementing section 6(h)'s directive. The EPA prohibited "all manufacture (including import), processing, and distribution in commerce of [decabromodiphenyl ether]" with some exceptions.[242] For phenol, isopropylated phosphate, the EPA prohibited most forms of processing and distribution of the chemical, and specifically prohibited its release into water during the manufacturing phase.[243]

How section 6 of TSCA may be applied to Intervention 1, reduce plastic production and pollution from production through the restriction of certain problematic and unnecessary primary polymers, chemicals of concern, and pollution:

If the EPA finds that a chemical ingredient in plastics manufacturing—such as plasticizers and plastic additives—presents an unreasonable risk of injury to human health or the environment, it must regulate the substance under the TSCA section 6(a). These regulations can include bans or restrictions on the chemical's production, processing, distribution, and specific uses.

The EPA has already regulated several substances involved in plastics production under its special authority to regulate persistent and bioaccumulative substances (see TSCA section 6(h)). The substances include:

- Decabromodiphenyl ether (a flame retardant used plastic electronics such as televisions, computers, audio and video equipment, textiles and upholstered articles, wire and cables for communication and electronic equipment, and other applications); and
- Phenol, isopropylated phosphate (3:1) (a plasticizer, a flame retardant, an anti-wear additive, or an anti-compressibility additive in hydraulic fluid, lubricating oils, lubricants and greases, various industrial coatings, adhesives, sealants, and plastic articles).

[239] 15 U.S.C. § 2605(h).
[240] 15 U.S.C. § 2605(h)(1)–(2); *see also* U.S. ENVTL. PROT. AGENCY, TSCA WORK PLAN FOR CHEMICAL ASSESSMENTS: 2014 UPDATE (Oct. 2014), https://www.epa.gov/sites/default/files/2015-01/documents/tsca_work_plan_chemicals_2014_update-final.pdf.
[241] *Persistent, Bioaccumulative, and Toxic (PBT) Chemicals under TSCA Section 6(h)*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/persistent-bioaccumulative-and-toxic-pbt-chemicals (last visited Mar. 14, 2024).
[242] Decabromodiphenyl Ether (DecaBDE); Regulation of Persistent, Bioaccumulative, and Toxic Chemicals Under TSCA Section 6(h), 86 Fed. Reg. 880 (Jan. 6, 2021) (codified at 40 C.F.R. pt. 751).
[243] Phenol, Isopropylated Phosphate (3:1) (PIP 3:1); Regulation of Persistent, Bioaccumulative, and Toxic Chemicals Under TSCA Section 6(h), 86 Fed. Reg. 894 (Jan. 6, 2021) (codified at 40 C.F.R. pt. 751).

Additionally, under section 6, EPA may be able to regulate microplastics particles in a similar way as it regulates airborne asbestos particles. Microplastics may share many of the same toxic properties as asbestos particles, including being persistent and bioaccumulative.[244]

g. Mandating Data Reporting and Transparency

Section 8 of TSCA authorizes the EPA to require reporting and record retention from chemical manufacturers and processors. The reporting authority under section 8(a) is broad, requiring the reporting of any information as the Administrator "may reasonably require."[245] Typically, these reports include the common or trade name of the chemical, the chemicals' general use, the total amount of each chemical manufactured, the chemical's byproducts, and "all existing information concerning the environment and health effects" of each chemical.[246] Section 8 also requires the EPA to use the information in these reports to maintain the Chemical Substance Inventory[247] and requires manufacturers to maintain records of any "significant adverse reactions to health or the environment, as determined by the Administrator by rule, alleged to have been caused by the substance or mixture."[248] Manufacturers must also submit information on these significant adverse reactions to the EPA.[249]

How section 8 of TSCA may support the interventions through information and/or data collection activities:
Using its authority under TSCA section 8, EPA can collect and publicize information from chemical manufacturers and processors regarding chemicals used in plastic production. The information collected can include data on the general environmental and health effects of plastic chemicals and specific "adverse reactions" to the environment or human health the chemical may cause.

3. Clean Water Act

As noted in the NASEM Report, the "presumptive largest path of plastic mass from land to the ocean is from rivers and streams moving plastic wastes from inland and coastal areas to the sea," though other pathways to water include wind and direct input.[250] The Clean Water Act (CWA) contains several levers to address plastic pollution that enters U.S. waters, including by updating effluent limitation guidelines for certain categories of discharges and requiring permitting of certain activities.

[244] Mary Ellen Ternes et al. Plastics Pollution Comment, *supra* note 140.
[245] 15 U.S.C. § 2607(a).
[246] 15 U.S.C. § 2607(a)(2).
[247] 15 U.S.C. § 2607(b).
[248] 15 U.S.C. § 2607(c).
[249] 15 U.S.C. § 2607(e).
[250] NASEM Report, *supra* note 5, at 7.

Unless authorized under a permit, the CWA prohibits the discharge of any "pollutant" from a "point source" into waters of the United States.[251] Pollutants are broadly defined under the CWA and include "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal and agricultural waste discharged into water."[252] Thus, plastic material and waste could fall within the definition of a pollutant under the CWA.

A point source is defined under the CWA as any "discernable, confined and discrete conveyance . . . from which pollutants are or may be discharged."[253] Discharge of pollutant means "any addition of any pollutant into navigable waters from any point source."[254] Discharge of pollutants means "any addition of any pollutant to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft."[255]

Under the National Pollutant Discharge Elimination System (NPDES), certain point source discharges into surface waters, publicly owned treatment works (POTWs), and groundwater that is the functional equivalent of a direct discharge may be permitted upon meeting conditions set forth in the CWA (sections 301, 302, 306, 307, 308, and 403 as well as additional conditions that may be necessary to carry out the purposes of section 402).[256] NPDES permittees can be generally categorized as municipal (i.e., POTWs) and non-municipal or industrial facilities (i.e., non-POTWs including federal facilities).[257] Within these categories, specific activities may be subject to certain programmatic requirements, as prescribed by NPDES regulations. Under the CWA, for example, POTWs must meet secondary treatment standards.[258]

The CWA does not establish effluent limits for sources of water pollution that do not meet the definition of "point source." This "nonpoint source" pollution comes from land runoff, precipitation, atmospheric deposition, and similar diffuse sources and is a major source of water quality problems, including from micro and macro plastics. EPA provides guidance and grants to states to develop plans to address this problem through its CWA section 319 authority and the Coastal Zone Management Act, jointly administered with NOAA.[259] States have experimented with ways of addressing this persistent issue, including by designating impaired waters, establishing total maximum daily loads, and implementing localized measures to reduce such inputs.[260]

a. Effluent Limitation and Effluent Limitation Guidelines (ELGs)

[251] 33 U.S.C. § 1311(a).
[252] 33 U.S.C. § 1362(6).
[253] 33 U.S.C. § 1362(14).
[254] 33 U.S.C. § 1362(12)(A).
[255] 33 U.S.C. § 1362(12)(B).
[256] 33 U.S.C. § 1342.
[257] U.S. ENVTL. PROT. AGENCY, NPDES PERMIT WRITERS' MANUAL, EPA-833-K-10-001, 2-5 (Sept. 2010) [hereinafter NPDES PERMIT WRITERS' MANUAL] (available at https://www.epa.gov/sites/default/files/2015-09/documents/pwm_2010.pdf).
[258] 33 U.S.C. § 1311(b)(1)(B).
[259] *See infra* ELI Report, at Section IV(C)(1)(a).
[260] *See infra* ELI Report, at Section IV(B)(3)(d).

NPDES permits for industrial and municipal dischargers must incorporate technology-based and water quality-based effluent limitations[261] (TBELs and WQBELs). TBELs express the floor of performance for specific categories of dischargers. When TBELs are insufficient to achieve water quality standards or site-specific water quality goals, WQBELs are used.

The TBELs in NPDES permits derive from EPA-promulgated effluent limitation guidelines (national ELGs or ELGs) and new source performance standards (NSPS).[262] EPA promulgates national ELGs for three classes of pollutants: (1) conventional pollutants; (2) nonconventional pollutants; and (3) toxic pollutants.[263] ELGs are "intended to represent the greatest pollutant reductions through technology that are economically achievable for an industry."[264]

i. Revisions and New ELGs

EPA has existing authority under sections 301, 304, 306, 307, 308 and 501 of the CWA to revise industry specific ELGs. Section 304(m) of the CWA directs the EPA Administrator to biennially publish a plan that, among other matters, sets a schedule for the annual review and revision of promulgated ELGs and identifies sources discharging toxic or nonconventional pollutants for which ELGs have not been promulgated.[265] As of the date of this report, EPA announced in its most recently published plan that it would commence an POTW influent study that focuses "on collecting nationwide data on industrial discharges of PFAS to POTWs."[266] EPA stated that it plans to "verify sources of PFAS wastewater and help POTWs assess the need for the control measures at the source."[267] Though a time- and resource-intensive process, EPA has existing authority to initiate similar review and study of, for example, industrial wastewater discharges of chemicals and additives most frequently used in plastic production that may be classified as toxic or nonconventional pollutants.

EPA issued a "Strategy for National Clean Water Industrial Regulations" in 2002 that articulated four factors the agency should use to determine whether revised ELGs are warranted in a given circumstance. They are:

> (1) the extent to which pollutants remaining in an industrial category's discharge pose a substantial risk to human health or the environment;

[261] 33 U.S.C. § 1362(11) (defining "effluent limitation" as "any restriction established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean, including schedules of compliance").
[262] 33 U.S.C. §§ 1311, 1314.
[263] 33 U.S.C. §§ 1314, 1311(b)(2)(F), 1317.
[264] *EPA Announces Plans for Wastewater Regulations and Studies, Including Limits for PFAS, New Study for Nutrients*, U.S. ENVTL. PROT. AGENCY (Jan. 20, 2023), https://www.epa.gov/newsreleases/epa-announces-plans-wastewater-regulations-and-studies-including-limits-pfas-new-study.
[265] 33 U.S.C. § 1314(m)(1)(A)–(B).
[266] U.S. ENVTL. PROT. AGENCY, EFFLUENT GUIDELINES PROGRAM PLAN 15, 6-19 (Jan. 2023).
[267] *Id*.

> (2) the availability of a treatment technology, process change, or pollution prevention alternative that can effectively reduce the pollutants and risk;
> (3) the cost, performance, and affordability of the technology, process change, or pollution prevention measures relative to their benefits; and
> (4) the extent to which existing effluent guidelines could be revised, for example, to eliminate inefficiencies or impediments to technological innovation or to promote innovative approaches.[268]

EPA relies on "nearly identical factors" in determining whether to establish new ELGs.[269] Thus, in furtherance of its obligation under section 304(m) to review and revise ELGs, EPA would likely apply these factors in determining whether any plastic chemical constituent warrants revision to the existing ELGs (e.g., for the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) category) or whether new ELGs are warranted in the first instance.

For example, the OCPSF ELGs regulations are codified at 40 C.F.R. Part 414 and apply to "more than 1,000 chemical facilities producing over 25,000 end products, such as benzene, toluene, polypropene, polyvinyl chloride, chlorinated solvents, rubber precursors, rayon, nylon, and polyester."[270] The OCPSF ELGs apply to "process wastewater discharges resulting from the manufacture of the products or product group listed in the rayon fibers, other fibers, thermoplastics resins, thermosetting resins, commodity organic chemicals, bulk organic chemicals, and specialty organic chemical subcategories"[271] and were last amended in 1993.

Additionally, effluent limitations have not been established for contaminated stormwater for the OCPSF category unless the stormwater is combined with process wastewaters.[272] Requirements for the treatment of stormwater from this category only arrive by way of Best Management Practices, such as filtration devices in state-issued industrial stormwater permits or for facilities that fall under EPA's Multi-Sector General Permits.[273] The boom of the plastics industry since the OCPSF ELGs were last amended and the gap in stormwater effluent limitations for this category supports the argument that the manufacturing of certain plastics under this category greatly outstrips its regulation.

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[268] Fact Sheet, U.S. Envtl. Prot. Agency, Draft Strategy for National Clean Water Industrial Regulations, EPA-821-F-02-021 (Nov. 2002).
[269] Draft Strategy for National Clean Water Industrial Regulations, 67 Fed. Reg. 71,165 (Nov. 29, 2002).
[270] *Organic Chemicals, Plastics, and Synthetic Fibers Effluent Guidelines*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/eg/organic-chemicals-plastics-and-synthetic-fibers-effluent-guidelines (last visited Mar. 14, 2024).
[271] 40 C.F.R. § 414.11(a).
[272] Ctr. Bio. Diversity, Petition to Revise the Clean Water Act Effluent Limitation Guidelines and Standards for the Petro-Plastics Industry Under the 40 C.F.R. pt. 419 Petroleum Refining Industry Category (Cracking and Petrochemicals Subparts) and Part 414 Organic Chemicals, Plastics, and Synthetic Fibers Industrial Category 39 (July 23, 2019) [hereinafter CBD CWA Petition] (*citing* U.S. Envtl. Prot. Agency, Technical Support Document for the 2004 Effluent Guidelines Program Plan, EPA-821-R-04-014).
[273] *Id*. at 39.

As explained above, EPA could engage its authority under section 304(m) to begin review of areas where the OCPSF ELGs need revision. EPA may also conduct a cross-industry review of particular pollutants most closely associated with plastic production, as the agency has recently done to address industrial discharges of the PFAS chemical group.

ii. Available Requirements Beyond Numeric ELGs

Generally used as a supplement to numeric ELGs, additional monitoring requirements can be imposed on NPDES permittees as a permit condition.[274] This can help assist NPDES permit writers collect data that was unavailable for consideration during the permit drafting/development stage.[275] Additional monitoring requirements can be employed when there are existing analytical methods available for permittees to use. This lever may serve as one targeted approach for permit writers and EPA to understand the scope of plastic pollution to better identify the object of future regulation.

b. Conventional Pollutants; Total Suspended Solids

EPA may consider regulating microplastics, or certain other identifiable plastics, as a conventional pollutant under the total suspended solids (TSS) subcategory. TSS generally communicates a measure of nonfilterable organic and inorganic material suspended in water.[276] Microplastics, or "plastic debris less than five millimeters in length," for example, could conceivably be accounted for in TSS measurements.[277] Adequate funding for EPA research, or EPA-funded research, and staff capacity would be needed to evaluate this potential lever; however, EPA has existing authority to identify new conventional pollutants under section 304(a)(4). "From time to time," EPA may "publish and revise as appropriate information identifying conventional pollutants, including but not limited to pollutants classified as . . . suspended solids."[278] Alternatively, and broadly speaking, the ubiquity of plastics in our environment may justify a new listing of plastic, certain plastic products, or common plastic chemical constituent(s) as a "conventional pollutant" in the first instance.[279] This too is technically permissible under section 304(a).

Challenges for either option may include defining the scope of plastics and/or microplastics as applicable to TSS, including how to treat plastics that float on, rather than suspend within, surface waters. Should EPA decide to include plastics, or any chemical component thereof, as a specified component of TSS or as a "conventional pollutant" independently, EPA would likely need to promulgate updated or new ELGs on an industry-by-industry basis.

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[274] 33 U.S.C. § 1342(a)(2) (providing that the EPA Administrator "shall prescribe conditions for such permits . . . including conditions on data and information collection, reporting, and such other requirements as he deems appropriate").
[275] NPDES PERMIT WRITERS' MANUAL, *supra* note 257257, at 9-2 (Sept. 2010).
[276] FMC Corp. v. Train, 539 F.2d 973, 977 n.3 (4th Cir. 1976).
[277] *What are Microplastics?*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://oceanservice.noaa.gov/facts/microplastics.html (last visited Mar. 14, 2023).
[278] 33 U.S.C. § 1314(a)(4).
[279] *See* 44 Fed. Reg. 44,501 (July 30, 1979) (establishing "oil and grease" as a conventional pollutant).

c. Toxic Pollutants and Priority Pollutants

Under the CWA, "toxic pollutant" is defined as

> those pollutants, or combination of pollutants, including disease-causing agents, which after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will, on the basis of information available to the Administrator, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including in reproduction) or physical deformations, in such organisms or their offspring.[280]

Through section 307 of the CWA, Congress created the "Toxic Pollutant List," which EPA was directed to adopt. Under section 307(a)(1), EPA may "from time to time revise [the toxic pollutant] list" and "add to or remove from such list any pollutant."[281] In doing so, EPA must "take into account[, among other factors, the] toxicity of the pollutant, its persistence, [and] degradability."[282]

Intended to be a "starting point" to address toxic pollutants in our nation's waterways, the Toxic Pollutant List is limited in that it lists only "broad categories of pollutants, rather than specific, individual pollutants."[283] To address this shortcoming, EPA established the "Priority Pollutant List," which lists individual pollutants from the Toxic Pollutant List. The Priority Pollutant List is intended to make the "implementation of the '[T]oxic [P]ollutant [L]ist' more practical for water testing and regulatory purposes."[284] As such, the pollutants listed under the Priority Pollutant List are those for which EPA has established analytical test methods. EPA concedes that both lists are outdated;[285] however, the toxic pollutant list already includes some chemical categories that are (or have been) used in plastic production (e.g., benzene, acenaphthene, and polychlorinated biphenyls).

While EPA has ample authority to address plastic pollution, in part, by thoughtfully and consistently reviewing its Toxic Pollutant and Priority Pollutant Lists to account for pollutants most commonly associated with plastic production, the Toxic Pollutant List, for example, has remained largely the same for nearly 50 years. The lack of revision to this list, and, consequently, the Priority Pollutant List, since that time has far-reaching impacts for a variety of sectors—the rapidly developing plastics industry included among them.[286] This matters because section 307 of the CWA authorizes EPA to

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[280] 33 U.S.C. § 1362(13).
[281] 33 U.S.C. § 1317(a)(1).
[282] *Id*.
[283] *Toxic and Priority Pollutants Under the Clean Water Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act (last visited Mar. 14, 2024).
[284] LAURA GATZ, CONG. RESEARCH SERV., R45998, CONTAMINANTS OF EMERGING CONCERN UNDER THE CLEAN WATER ACT 4 (2021) [hereinafter CONG. RESEARCH. SERV., R45998].
[285] *Toxic and Priority Pollutants Under the Clean Water Act*, *supra* note 2833.
[286] *See, e.g.*, Northwest Envtl. Advocates & Ctr. Bio. Diversity, Petition for Rulemaking to Update the Toxic Pollutant and Priority Pollutant Lists & Identify Pollutants that Require Pretreatment Standards (July 2023) (discussing, in part, the implications of EPA's failure to update the toxic pollutants lists on national ELGs and pretreatment standards).

promulgate ELGs that establish requirements for those listed toxic and nonconventional[287] pollutants based on the best available technology.[288]

Should EPA add pollutants frequently associated with plastic production to the Toxic Pollutant List, it would likewise need to "develop and publish information on methods for establishing and measuring water quality criteria for toxic pollutants on other bases than pollutant-by-pollutant criteria, including biological monitoring and assessment methods."[289] States and tribes recognized in a similar manner as a state would need to incorporate numeric criteria for those listed pollutants within their individual water quality standards, which would be translated into 402 permits.

d. Technical Guidance on Trash Assessment Methodologies and Developing TMDLs for Trash

Under Section 303(d) of the CWA, states, authorized tribes, and territories (collectively, "states") are required to develop lists of impaired waters within their jurisdictions and submit an updated list periodically to EPA.[290] Waters are impaired when they do not meet water quality standards. States also are required to develop total maximum daily loads (TMDLs) for any waters impaired due to a pollutant. A TMDL, sometimes referred to as a "pollution diet" or "pollution budget," identifies the amount of a specific pollutant that a water body can receive while still meeting its water quality standards, accounting for a margin of safety.[291]

EPA can offer guidance to states and EPA regions that seek to exercise their CWA authorities to address waters impaired by trash or debris. EPA could examine a relevant example from California to inform potential agency guidance. In 2015, the California State Water Resource Control Board adopted the state's Trash Amendments, which established a narrative water quality objective for trash, prohibited the discharge of trash, created implementation requirements in stormwater permits, time schedules for compliance, and monitoring and reporting requirements. The Trash Amendments were adopted after California submitted its 2010 Integrated Report to EPA, which listed 73 water segments as impaired for trash or debris in the state.[292] The Trash Amendments apply to all surface waters of California—with the exception of the waters within the jurisdiction of the Los Angeles Regional Water Board where trash TMDLs were already in effect—and is primarily implemented in CWA section 402 permits. Because the Trash Amendments apply to nearly all California surface waters and are implemented through 402 permits, the Trash Amendments can be viewed as a state-wide TMDL program. The state program: (1) established a zero percent discharge goal by 2030; (2) applies to all regulated stormwater discharges to surface waters; (3) mandates that all stormwater permits statewide require the capture of particles less than or equal to five millimeters generated from one-year, one-hour storm events; (4) promotes full capture trash devices installed in stormwater conveyance systems; (5) requires solids removal and trash

[287] *See* NPDES PERMIT WRITERS' MANUAL, *supra* note 2577, at 1-6 (explaining that nonconventional pollutants are those pollutants not classified as either conventional or toxic).
[288] 33 U.S.C. § 1317(a)(2); CONG. RESEARCH SERV., R45998, *supra* note 2844, at 10.
[289] 33 U.S.C. § 1314(a)(8).
[290] 33 U.S.C. § 1313(d).
[291] 40 C.F.R. § 130.7.
[292] Cal. State Water Resources Ctl. Bd., Resolution 2015-0019 (April 7, 2015).

management through regulatory permits for wastewater and stormwater discharges; and (6) focuses on trash controls on high production land use areas.[293]

EPA may exercise its discretion to convene with interested stakeholders (e.g., EPA Region Nine, California Water Resources Control Board, etc.) and similarly situated EPA regions or states to develop a national literacy of successful CWA state programs and methodologies that address trash and debris pollution.

e. Revising Regulations for Biosolids and Land Use Applications

Under section 405(d) of the CWA, the EPA Administrator is authorized to identify which "toxic pollutants . . . may be present in sewage sludge [i.e., biosolids] in concentrations which may adversely affect public health or the environment."[294] EPA is also authorized to "propose regulations specifying acceptable management practices for sewage sludge containing each such toxic pollutant and establish[] numerical limitations for each such pollutant for each [specified] use" (i.e., biosolids regulations).[295]

The self-implementing biosolids regulations are located at 40 C.F.R. Part 503 and apply to "any person or treatment works that prepares sewage sludge, applies sewage sludge to the land, fires sewages sludge in an incinerator, and the owners and operators of surface sites."[296] These regulations include "pollutant limits, requirements for pathogen and vector attraction reduction, management practices, monitoring, recordkeeping, and reporting among other requirements."[297] EPA is also required to review the biosolids regulations not less than every years to "identif[y] additional toxic pollutants and promulat[e] regulations for such pollutants consistent with [section 405(d)]."[298]

Under the biosolids regulations, "pollutant" means

> an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including

[293] Monterey Bay Aquarium, Comments to EPA's Draft National Strategy to Prevent Plastic Pollution, EPA-HQ-OLEM-2023-0228 (July 31, 2023) [hereinafter MBA Plastic Pollution Comments].
[294] 33 U.S.C. § 1345(d)(2)(A)(i).
[295] *Id*.
[296] 40 C.F.R. § 503.1(b).
[297] *Biosolids Laws and Regulations*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/biosolids/biosolids-laws-and-regulations (last visited Mar. 14, 2024).
[298] 33 U.S.C. § 1345(d)(2)(C); *see also* 40 C.F.R. pt. 503 (establishing the standards for use or disposal of sewage sludge).

> malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.[299]

First, EPA could limit microplastic biosolids content simply by recognizing microplastic's known potential to grow pathogens and create disease vectors,[300] which falls within EPA's current authority.[301] The Agency may consider developing a risk assessment framework, as is currently underway for two PFAS compounds,[302] for microplastic biosolids content, pursuant to its authority under section 405(d) of the CWA.

Second, though microplastics are not currently listed as a toxic pollutant under the CWA, EPA still maintains the statutory authority to list microplastics as a toxic pollutant. Doing so would also require EPA, as part of its biosolids regulation review process, to update the regulations to account for this "new" pollutant. The data collected from this review process could result in the development of risk assessments of pollutants—here, microplastics—found in biosolids. The culmination of this process and subprocesses could result in the agency updating the biosolids regulations to require acceptable management practices and numerical limitations for microplastics in biosolids and, ideally, a zero-concentration numerical limit for land use application.

EPA action to address microplastic pursuant to biosolids regulation would be appropriate; large volumes of treated effluent can still reintroduce microplastics and nanoplastics into the environment in the aggregate through land use application.[303]

f. Trash Free Waters Program (Trash Capture Devices & Microplastic Beach Protocol)

One federal lever carried out generally under the Clean Water Act to address plastic pollution removal from waterways is the Trash Free Waters Program (TFWP). Created in 2013 by the EPA Office of Water, the TFWP is a voluntary partnership program among a variety of stakeholders—federal agencies, state and local government, NGOs, and communities, among others—to prevent waste generation, remove trash from U.S. waterways, and improve understanding of sources,

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[299] 40 C.F.R. § 503.9(t).

[300] *See* Pierre-Oliver Maquart et al., *Plastic Pollution and infectious diseases*, 6 LANCET PLANETARY HEALTH e775, e842–45 (October 2022) (explaining that "plastic debris that holds water can encourage arthropod-borne diseases by providing a habitat for some vectors' immature states and shelter to anthropophilic and medically important species, potentially increasing local vector populations with implication for disease burden [and that] by acting as a stagnant water reservoir, waste plastic promotes the development of pathogenic (such as leptospirosis) and harmful algae").

[301] *See, e.g.*, 40 C.F.R. § 503.1(a)(1) (describing that the "pathogen and alternative vector attraction reduction requirements for sewage sludge applied to the land or placed on a surface disposal site" are also included in Part 503).

[302] *See Risk Assessment of Pollutants in Biosolids*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/biosolids/risk-assessment-pollutants-biosolids#pfas (last visited Mar. 14, 2024) (detailing EPA's current efforts to conduct a biosolids risk assessment for two PFAS compounds in biosolids pursuant to its PFAS Strategic Roadmap).

[303] A. Sudharshan Reddy & Abhilash T. Nair, *The fate of microplastics in wastewater treatment plans: An overview of source and remediation technologies*, 28 ENVTL. & TECH. INNOVATION 102815, 102815 (2022).

impacts, and pathways of aquatic trash.[304] This program has funded and supported a variety of trash prevention projects by providing technical, financial, and contractor assistance.[305]

In 2019, the Office of the Inspector General (OIG) conducted an audit of several EPA programs, including the TFWP, to "identify the extent to which [the programs] address threats and the risks to public health and the environment from trash, including plastic, within the waters of the U.S."[306] As a result of this audit, EPA issued two reports to respond to the OIG findings, strengthen the program, and improve guidance and tools to be used in these projects: (1) the Office of Research and Development Initiatives to Address Threats and Risks to Public Health and the Environment from Plastic Pollution Within the Waters of the U.S.; and (2) EPA Helps States Reduce Trash, Including Plastic, in U.S. Waterways but Needs to Identify Obstacles and Develop Strategies for Further Progress.[307]

During the development of the latter report, EPA's Office of Water issued two technical guidance documents relevant to Intervention 5: (1) the Trash Stormwater Permit Compendium; and (2) the U.S. EPA Escaped Trash Assessment Protocol (ETAP). The Trash Stormwater Permit Compendium is intended "to provide Phase I and Phase II Municipal Separate Storm Sewer System (MS4) permit writers with tools and information they can use in developing trash-related provisions for MS4 permits."[308] EPA notes that MS4 permit writers can use the Compendium to learn more about Best Management Practices for trash reduction, apply lessons learned from two successful case studies of relevant MS4 permits, and use sample trash provisions in existing MS4 permits as a starting point.[309] Most importantly, EPA expressly states that the agency "has an interest in ensuring the accuracy of the [Compendium] information . . . welcomes input on any aspect of th[e] [C]ompendium *at any time* and expects to update the [C]ompendium as needed based on comments received and new information."[310] EPA can align its agency initiatives with Intervention 5 to remove trash from waterways by fulfilling its self-imposed initiative to continually update the Compendium.

The ETAP complements the Compendium and other EPA efforts, as it is a "quantitative survey tool which provides a standard method for collecting and assessing litter data . . . [which] can also be used to assess item age and level of fouling and analyze and compare across specific material types

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[304] *EPA's Trash Free Waters Program: Supporting Healthy Communities and Vibrant Ecosystems*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/system/files/documents/2022-02/epa-tfw-trifold-final-2-electronic-version.pdf (last visited Mar. 14, 2024).

[305] Examples include the "Trash Free Mystic River Strategy" in Region 1 and the "Proctor Creek Trash Removal and Prevention" project in Region 4.

[306] Memorandum from Kathlene Butler, Dir., Water Directorate, Off. Of Audit and Eval., on the Effectiveness of Clean Water Act to Protect from Plastic Pollution to David P. Ross, Assistant Adm'r, Off. of Water, and Jennifer Orme-Zavaleta, Prin. Deputy Assistant Adm'r for Sci., Off. of Rsch. And Dev. (Oct. 30, 2019).

[307] Rachael E. Salcido, *Plastic Activism and the Clean Water Act*, 52 ENVTL. LAW REV. 307, N.65 (2022).

[308] *Trash Stormwater Permit Compendium,* EPA-841-R-21-001*,* U.S. ENVTL. PROT. AGENCY (Apr. 2021) (available at https://www.epa.gov/system/files/documents/2021-09/ms4_trash_compendium_april-2021-with-pub-number_0.pdf).

[309] *Id*. at 1.

[310] *Id*. (emphasis added).

and categories of trash collected."[311] EPA notes that ETAP data can "eventually be used to guide upstream source reduction decisions."[312] The administration and maintenance of this tool can be viewed as a "step zero" to addressing the removal of plastic waste from waterways—consonant with the objectives of Intervention 5—as it would arm practitioners with the necessary data to incorporate trash reduction objectives.

i. Funded Projects under the TFWP: Trash Capture Devices

One project EPA helped to fund under the TFWP is the San Francisco Trash Capture Demonstration Project, the purpose of which was to "facilitate funding to Bay Area municipalities for trash capture devices to help fulfill stormwater permit trash requirements while helping municipal staff gain knowledge of different device types and their appropriateness to different land uses."[313] The purchase and installation of trash capture devices as a result of this project helped several municipalities in meeting their trash reduction goals, as specified in the San Francisco Regional Stormwater NPDES permit.

The funding for this project was accomplished through the CWA's State Revolving Fund (CWSRF) and American Recovery and Reinvestment Act (ARRA). The CWSRF is used to fund a variety of water quality protection efforts, including the construction of municipal wastewater facilities and projects to control nonpoint sources of pollution.[314] The scope of projects eligible for CWSRF funding has expanded since the Fund's establishment. Recently, the ARRA and Water Resources Reform and Development Act have expanded project eligibility. The ARRA, for example, created the Green Project Reserve, which "increased the focus on green infrastructure, water and energy efficiency, and environmentally innovative projects."[315] The successes of the San Francisco Trash Capture Demonstration Project, discussed above, have included the installation of over 4,000 small and large trash capture devices and the creation of a secure, online resource for local staff to upload and download device maintenance data.[316]

Through this federal-state financial assistance program, EPA can continue to fund initiatives that capture and remove plastic waste once it has been discarded, disposed, or leaked into the environment. Because the development and installation of trash capture devices requires ample upfront costs, site-specific research on where trash accumulates in waterways and the cost-effectiveness of trash capture devices, and stakeholders for long-term maintenance, including trash removal and data collection on the waste diverted, EPA can "consider small grant programs to fund these efforts and remove cost barriers."[317]

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[311] *EPA's Escaped Trash Protocol (ETAP)*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/trash-free-waters/epas-escaped-trash-assessment-protocol-etap (last visited Mar. 14, 2024).
[312] *Id*.
[313] *Trash Capture Projects*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/trash-free-waters/trash-capture-projects#sf (last visited Mar. 14, 2024).
[314] 33 U.S.C. § 1383; *see also*, *About the Clean Water State Revolving Fund*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/cwsrf/about-clean-water-state-revolving-fund-cwsrf (last visited Mar. 14, 2024).
[315] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115; U.S. ENVTL. PROT. AGENCY, OVERVIEW OF CLEAN WATER STATE REVOLVING FUND ELIGIBILITIES 1 (May 2016).
[316] *Id*.
[317] Ocean Conservancy Plastic Pollution Comments, *supra* note 6666, at 20.

ii. Citizen Science Protocols for Monitoring Microplastics

EPA can continue to build upon existing federal research efforts to monitor and measure macro, micro, and nanoplastics under its TFWP. For example, EPA's 2021 "Microplastic Beach Protocol" offers strategies to community scientists for the collection and analysis of microplastic pollution data "along both freshwater and marine beaches and shorelines."[318] This protocol, in part, supports the use of NOAA's Marine Debris Tracker—a digital application and website that enables users to log data on microplastics collection, among other information. This effort was presumably funded through financial assistance available through EPA's TFWP.

By providing citizen scientists with the information relevant to study microplastics in marine and freshwater beaches and shorelines, EPA can gain a better understanding of the scope of this pervasive issue. By implementing reference to NOAA's Marine Debris Tracker, the Microplastic Beach Protocol also serves as an initiative that drives interagency coordination to broadly address Intervention 5: to capture plastic waste.

iii. Regional EPA Programs Grants: Funding Research for Prevention of Plastic Pollution Leakage

Regional efforts can continue to be employed to understand the fate and transport of plastic trash in our nation's waterways. For example, EPA's Gulf of Mexico Division—"a non-regulatory program of EPA founded to facilitate collaborative actions to protect, maintain, and restore the health and productivity of the Gulf of Mexico"—collaborated with NGOs to "undertake a comprehensive assessment of trash resources, transport routes, fate, and enforcement effectiveness in the Upper Dog River Watershed in Alabama."[319] One of the objectives of this program was to "use hydrologic models and geographic information system datasets to identify likely pathways of litter to receiving waters."[320]

This project was funded through EPA's Gulf of Mexico Program Grants, authorized under the CWA section 104(b)(3), which permits the EPA to "make grants to State water pollution control agencies, interstate agencies, other public or nonprofit private agencies, institutions, organizations, and individuals, for research . . . and studies relating to the causes, effects, extent, prevention, reduction, and elimination of pollution."[321]

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[318] U.S. ENVTL. PROT. AGENCY, MICROPLASTICS BEACH PROTOCOL 3 (Sept. 2021).

[319] U.S. ENVTL. PROT. AGENCY, OFF. OF INSPECTOR GEN., REPORT NO. 21-P-0130, EPA HELPS STATES REDUCE TRASH, INCLUDING PLASTIC, IN U.S. WATERWAYS BUT NEEDS TO IDENTIFY OBSTACLES AND DEVELOP STRATEGIES FOR FURTHER PROGRESS 8 (2021).

[320] MOBILE BAY NAT'L ESTUARY PROGRAM, DOG RIVER WATERSHED TRASH ABATEMENT PROGRAM HYDROLOGIC AND LAND USE GIS ANALYSIS TO IDENTIFY TRASH CONCENTRATIONS 5 (2021) (available at https://www.mobilebaynep.com/assets/pdf/GISAnalysisReport-V9_Final.pdf).

[321] 33 U.S.C. § 1254(b)(3) (citing 1254(a)(1)).

EPA can continue to use its CWA section 104(b)(3) grant authority to fund projects that seek to develop local, regional, and federal literacy in plastic pollution leakage. In so doing, EPA can continue to improve plastic waste management.

How section the Clean Water Act may be applied to Intervention 1, reduce plastic production and pollution from production
More thoroughly regulating the discharge limits of chemicals and additives most closely associated with plastic production—as would then be translated into National Pollutant Discharge Elimination System (NPDES) permits—is one way in which EPA could reduce pollution from plastic production.

How the Clean Water Act may be applied to Intervention 3, decrease waste generation by regulating and reducing loss of preproduction pellets:
EPA can list microplastics (including plastic pellets) as a conventional pollutant under section 304(a)(4), the standards for which would need to be incorporated into section 402 permits.

How the Clean Water Act may be applied to Intervention 4, improve waste management through treatment improvements to remove plastic waste from discharges:
NPDES permit writers (at the federal, state, and tribal levels) can impose additional monitoring and data collection requirements on NPDES permittees (including plastic producers), so long as existing analytical methods are available, to better understand the object of plastic pollution regulation and inform future, targeted regulatory efforts. Through its CWA section 104(b)(3) grant authority, EPA can continue to fund research and studies that seek to address plastic pollution, trash, and debris leakage. This action would serve as an agent to Intervention 4 because it would help EPA and other affected stakeholders better identify the transport of plastic pollution: a necessary first step to improve discharge treatments. EPA can better manage the introduction and re-introduction of microplastics and nanoplastics into the environment by prohibiting the use of biosolids with high concentrations of microplastics and nanoplastics as a land application use and establish strict pre-treatment requirements for biosolids before land application.

How the Clean Water Act may be applied to Intervention 4, improve waste management through National Pollutant Discharge Elimination System (NPDES), stormwater limits and treatment:

Updating the existing ELGs for the OCPSF industrial category—as well as the Petroleum Refining and Plastics Molding and Forming categories—or promulgating new ELGs for the OCPSF category would improve the floor of performance standards for these NPDES dischargers. In doing so, BAT would likely need to be updated, which could limit the wastewater discharges of substances most closely associated with plastic production.

EPA can revise its Toxic Pollutant and Toxic Priority Pollutant List to include contaminants most closely associated with plastic production, which would require incorporation into 402 permits.

The aforementioned levers to directly and indirectly address plastic pollution under the CWA most squarely fit within Intervention 4 regarding surface water discharge limits and treatments improvements to remove plastic waste from discharges. To note, the levers listed above—albeit somewhat constrained because the CWA does not regulate what manufacturers can produce—would not require additional legislative authorization and are currently available at EPA's disposal.

How the Clean Water Act may be applied to Intervention 5, capture waste to remove plastic waste from waterways and hotspots:

The Trash Free Waters Program, the OIG Audit, and EPA audit responses demonstrate a tenable, iterative structure for federal agencies to address plastic pollution and removal generally on a voluntary basis. Funds available through the Clean Water Act's State Revolving Fund for projects that successfully implement trash capture devices is one example of how EPA can exercise its discretion to assist states, tribes, and municipalities capture and remove trash from local waterways and hotspots.

4. Safe Drinking Water Act

EPA has existing authority to address microplastic and nanoplastic contamination in public drinking water supplies. The Safe Drinking Water Act (SDWA), Title XIV of the Public Health Service Act, was enacted to safeguard the quality of U.S. drinking water against harmful contaminants. EPA is authorized to administer the SDWA "through programs that establish standards and treatment requirements for public water supplies [(PWS)], finance drinking water infrastructure projects, promote water system compliance, and control the underground injection of fluids to protect underground sources of drinking water."[322]

Under the SDWA, EPA has general authority to publish a maximum contaminant level goal (MCLG) and promulgate a national primary drinking water regulation (NPDWR) for a given contaminant

[322] ELENA H. HUMPHREYS & MARY TEIMANN, CONG. RESEARCH SERV., RL31243, SAFE DRINKING WATER ACT (SWDA): A SUMMARY OF THE ACT AND ITS MAJOR REQUIREMENTS 1 (2021).

upon the determination that the: (1) "the contaminant may have an adverse effect on the health of persons;" (2) "the contaminant is known to occur or there is substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern;" and (3) regulation of such may reduce health risks for persons served by public water systems.[323] This process generally results in an maximum contaminant level (MCL), or the "maximum permissible level of a contaminant in water which is delivered to any user of a [PWS]."[324] To accomplish this goal, however, EPA would need to first identify microplastics or nanoplastics as a contaminant that warrants regulation.

a. Unregulated Contaminants

i. Contaminant Consideration List

The SWDA directs EPA to publish every five years a list of contaminants for consideration (CCL), which designates contaminants that are not currently subject to any national primary drinking water regulation but "are known or anticipated to occur in public water systems."[325] In developing the CCL, EPA is directed to prioritize those contaminants that pose "the greatest public health concern," which is informed by factors such as

> the effect of such contaminants upon subgroups that comprise a meaningful portion of the general population (such as infants, children, pregnant women, the elderly, individuals with a history of serious illness, or other subpopulations) that are identifiable as being at greater risk of adverse health effects due to exposure to contaminants in drinking water than the general population.[326]

An existing lever EPA may exercise to address plastic waste is to list microplastics or nanoplastics on the CCL.[327] Microplastics, for example, may qualify as a contaminant that poses a great public health concern, as microplastics have been documented in drinking water and can potentially contribute to adverse health impacts across a variety of subpopulations.[328]

ii. Unregulated Contaminant Monitoring Rule

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[323] 42 U.S.C. § 300g-1(b)(1)(A).
[324] 42 U.S.C. § 300f(3).
[325] 42 U.S.C. § 300g-1(b)(1)(B)(i)(I).
[326] 42 U.S.C. § 300g-1(C).
[327] *See* NRDC Plastic Pollution Comments, *supra* note 226.
[328] *See* Raffaele Marfella et al., *Microplastics and Nanoplastics in Atheromas and Cardiovascular Events*, NEW ENGLAND J. MED. (Mar. 7, 2024) (explaining that "[i]n this study, patients with carotid artery plaque in which [microplastics and nanoplastics] were detected had a higher risk of a composite myocardial infarction, stroke, or death from any cause at 34 months of follow-up than those whom [microplastics and nanoplastics] were not detected"); *but see*, WORLD HEALTH ORG., DIETARY AND INHALATION EXPOSURE TO NANO- AND MICROPLASTIC PARTICLES AND POTENTIAL IMPLICATIONS FOR HUMAN HEALTH, 13 (2022) [hereinafter WHO MICROPLASTICS AND HUMAN HEALTH] (stating that microplastics occur in drinking water . . . although insufficient quantitative data are available for a full exposure assessment).

The 1996 SWDA Amendments and section 2021 of the America's Water Infrastructure Act of 2018 together require EPA to administer a monitoring program and collect national occurrence data for unregulated contaminants.[329] Every five years, EPA must publish an unregulated contaminant monitoring rule (UCMR) that requires PWS to monitor certain (but no more than 30) unregulated contaminants. The UCMR list is based on both the CCL and other data and is developed based on a multi-step prioritization scheme.

In the first step of this process, EPA will identify contaminants that: (1) were not previously monitored in a UCMR cycle; (2) may occur in drinking water; and (3) are expected to have a completed validated analytical testing method in advance of the rule proposal.[330] EPA will then consider the availability of health assessments or health information performed for the contaminant, public interest, active use, and availability of occurrence data to refine the UCMR contaminant list. Finally, EPA will consider "stakeholder input," implementation obstacles, and "cost-effectiveness of potential monitoring approaches," among other factors, to refine the final UCMR list.[331]

While EPA can exercise its existing authority to list microplastics and/or nanoplastics on the CCL, the agency can also begin evaluating testing and monitoring methods for microplastics and/or nanoplastics before the next UCRM is published (UCRM 6).[332] EPA can draw upon existing state, tribal, or local level examples, such as the California State Water Resources Control Board's (State Water Control Board) recent resolution to monitor microplastics in drinking and source waters. Acknowledging the "rapidly evolving science regarding microplastics," the State Water Control Board has articulated a "two-phase iterative approach for monitoring microplastics to obtain sufficient information to estimate risk through exposure via drinking water."[333] In its 2022 Policy Handbook Establishing a Standard Method of Testing and Reporting of Microplastics in Drinking Water, the State Water Control Board explains that

> [e]ach step [of the iterative approach] will last two (2) years, with an interim period to allow for State Water Board staff to assess results

[329] 42 U.S.C. § 300j-4(a)(2).

[330] *Learn About the Unregulated Contaminant Monitoring Rule*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/dwucmr/learn-about-unregulated-contaminant-monitoring-rule (last visited Mar. 14, 2024).

[331] *Id*.

[332] NRDC Plastic Pollution Comments, *supra* note 226; Earthjustice Plastic Pollution Comments, *supra* note 201.

[333] Ca. State Water Res. Control Bd., Res. No. 2022-0032, Adopting a Policy Handbook Establishing a Standard Method of Testing and Reporting of Microplastics in Drinking Water (2022) (explaining that "[e]ach step will last two (2) years, with an interim period to allow for State Water Board staff to assess results from the first phase and plan the second phase of monitoring accordingly. For both phases, the State Water Board will issue orders to the public water systems and/or wholesaler providers to monitor microplastics in sources waters and/or treated drinking water. In Phase I, monitoring will focus on characterizing occurrence of microplastics larger than 20 or 50 micrometers in length in course waters used for drinking in accordance with the specifications in the method employed by the laboratory [omitted]. Phase II monitoring will be directed towards characterizing occurrence of microplastics both smaller than and larger than 20 micrometers in length in treated drinking water.").

> from the first phase and plan the second phase of monitoring accordingly. For both phases, the State Water Board will issue orders to the public water systems and/or wholesaler providers to monitor microplastics in sources waters and/or treated drinking water. In Phase I, monitoring will focus on characterizing occurrence of microplastics larger than 20 or 50 micrometers in length in course waters used for drinking in accordance with the specifications in the method employed by the laboratory [omitted]. Phase II monitoring will be directed towards characterizing occurrence of microplastics both small than and larger than 20 micrometers in length in treated drinking water.[334]

This example serves as an informative, and potentially singular, model for the EPA to draw upon because it identified the object of regulation (i.e., defining "microplastics"), established requirements for four years of testing and reporting of microplastics in drinking water, and set forth public disclosure requirements.[335]

iii. Health Advisories

EPA may also "publish [final] health advisories [(HAs)] . . . for contaminants not subject to any national primary drinking water regulation."[336] As an interim step, EPA can exercise this authority as a first step in addressing plastic, and microplastics and nanoplastics contamination in PWS.[337] A microplastics HA would "describe information about health effects, analytical methodologies, and treatment technologies" for this type of contamination.[338] Though not legally enforceable, a microplastics HA could allow EPA to begin to wrap its proverbial arms around microplastic pollution in PWS because states, tribes, and local governments can use a published HA to determine whether local actions are needed for their residents. EPA may also publish "interim or provisional HA levels to provide information in response to an urgent or rapidly developing situation."[339] The agency has recently exercised this authority for PFOA and PFOS drinking water contaminants in 2009 and 2022,[340] which has led to a proposed NPDWR for six PFAS, published in 2023.[341] Given the ballooning issue of plastic pollution, an interim microplastics HA may be warranted. This especially

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[334] Ca. State Water Res. Control Bd., Res. No. 2022-0032.
[335] MBA Plastic Pollution Comments, *supra* note 2933.
[336] 42 U.S.C. § 300g-1(b)(1)(F).
[337] *See, e.g.,* Earthjustice Plastic Pollution Comments, *supra* note 201.
[338] *Drinking Water Health Advisories (HAs)*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/sdwa/drinking-water-health-advisories-has#:~:text=Currently%20Under%20Development-,Health%20Advisories%20Explained,)(1)(F)%20 (last visited Mar. 14, 2024).
[339] *Id*.
[340] *Drinking Water Health Advisories for PFOA and PFOS*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/sdwa/drinking-water-health-advisories-pfoa-and-pfos (last visited Mar. 14, 2024); Press Release, U.S. Envtl. Prot. Agency, EPA Announces New Drinking Water Health Advisories for PFAS Chemicals, $1 Billion in Bipartisan Infrastructure Law Funding to Strengthen Health Protections (June 15, 2022).
[341] PFAS National Primary Drinking Water Regulation Rulemaking, 88 Fed. Reg. 18,638 (proposed Mar. 29, 2023) (to be codified at 40 C.F.R. pts. 141, 142).

relevant for public health considerations as the SDWA "does not provide recourse against the entity responsible for the presence of plastics in the drinking water supply."[342]

How SDWA may be applied to Intervention 5, capture waste to remove plastic wastes from waterways:
The above listed federal levers (listing microplastics on the CCL, requiring analytical testing methods in preparation of UCRM 6, establishing an MCL for microplastics, and issuing a microplastics HA) all possess a nexus to Intervention 5, which seeks to address the capture of plastic waste in the environment, including the removal of plastic waste from waterways (including drinking water). A binding NPDWR for microplastics would require certain monitoring and technological improvements for publicly owned and private PWS.[343] Nonbinding actions, such as establishing an MCLG or HA for microplastics, though not legally enforceable, could conceivably help motivate and direct local monitoring, testing, and treatment requirements.

5. Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA)—the first amendment to the Solid Waste Disposal Act[344]—establishes the statutory framework for the regulation of the generation, storage, and disposal of solid waste, including solid waste that is hazardous.

a. Nonhazardous Solid Waste

As a threshold matter, and as the United States moves to address and remedy its contributions to the global plastic crisis, EPA can affirm that discarded plastic waste is, minimally, solid waste under RCRA. Under RCRA, "solid waste" is defined as

> garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the

[342] *Compilation Memorandum regarding the GSCE Plastics*, *supra* note 205.
[343] That provide piped water for human consumption at least 15 service connections or that regularly serve at least 25 people.
[344] *EPA History: Resource and Conservation Recovery Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/history/epa-history-resource-conservation-and-recovery-act (last visited Mar. 14, 2024).

> Federal Water Pollution Control Act [or otherwise exempted under the Atomic Energy Act of 1954].[345]

EPA further defines "solid waste" as "any discarded material," meaning material that is abandoned, recycled, considered inherently waste-like, or military munition that is identified as solid waste.[346] Microplastics in the environment, for example, would likely constitute solid waste, as they are synthetic materials that have been released, discarded, and abandoned. If microplastics were released into the environment pursuant to federal authorization, then perhaps they would not constitute solid waste pursuant to one of the many exemptions from the definition of solid waste, including "federally permitted releases." However, microplastic is generally not considered as a separate pollutant for permitting purposes, though there are exceptions.[347]

When a solid waste is neither listed nor characteristic hazardous waste, it is subject to RCRA Subtitle D. RCRA Subtitle D establishes the solid waste program: a "framework for federal, state, and local government cooperation in controlling the management of non-hazardous solid waste."[348] While implementation of RCRA Subtitle D programs is largely within state and local government domain via Solid Waste Management Plans, the role of the federal government in this framework is to "establish the overall regulatory direction, by providing minimum nationwide standards that will protect human health and the environment, and to provide technical assistance to states for planning and developing their own environmentally sound waste management practices."[349]

The minimum nationwide standards noted above are articulated in EPA's guidelines for solid waste management that the agency publishes pursuant to section 1008(a) of RCRA.[350] These guidelines shall "provide minimum criteria to be used by the [s]tates to define those solid waste management practices which constitute the open dumping of solid waste or hazardous waste and are to be prohibited under subtitle D of [RCRA]."[351] Minimum criteria requirements promulgated under this authority are enforceable under section 7002 of RCRA. Under RCRA, "open dump" means "any facility or site where solid waste is disposed of which is not a sanitary landfill which meets the criteria promulgated under [42 U.S.C. § 6944] and which is not a facility for disposal of hazardous waste."[352]

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[345] 42 U.S.C. § 6903(27); *see also* 40 C.F.R. § 257.2.
[346] 40 C.F.R. § 261.2(a).
[347] *See, e.g.*, San Antonio Bay Estuarine Waterkeeper v. Formosa Plastics Corp., No. 6:17-cv-0047, 2019 U.S. Dist. LEXIS 108082 (S.D. Tex. June 27, 2019) (discussing Texas CWA permit that prohibited the "discharge of floating solids and foam in other than 'trace amounts'" in the permitted industrial wastewater discharge).
[348] *See* 42 U.S.C. §§ 6941 et seq.; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities, 80 Fed. Reg. 21,302, 21,310 (April 17, 2015).
[349] Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities, 80 Fed. Reg. at 21,310.
[350] 42 U.S.C. § 6907(a); *see* 42 U.S.C. § 6903(28) (defining "solid waste management" as "the systematic administration of activities which provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of solid waste").
[351] 42 U.S.C. § 6907(a)(3).
[352] 42 U.S.C. § 6903(14).

Pursuant to this authority, EPA may consider issuing guidance clarifying that areas where plastic waste has been intentionally dumped, negligently escaped, or has otherwise accumulated and resulted in potential plastic hotspots[353] must be evaluated for identification as open dumps, which are prohibited under RCRA section 4003(a). EPA has issued similar guidance for the disposal of coal combustion residuals from electric utilities.[354] Doing so could "compel states to identify open dumps, including permitted landfills with plastic leakage, as well as areas polluted with plastic waste"[355] pursuant to existing authority.[356] After states identify such open dumps, they would be required to amend their Solid Waste Management Plans with methods for collecting and eliminating leakage.

b. Hazardous Solid Waste

Under RCRA, EPA is authorized to regulate hazardous waste from "cradle to grave," meaning from generation to disposal. "Hazardous waste" under RCRA means a

> solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical chemical, or infectious characteristics may —
>
> (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
>
> (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.[357]

EPA's RCRA-implementing regulations further articulate the criteria for determining whether a material is hazardous waste: (1) it must meet the regulatory criteria for solid waste (see above); (2) it must not be excluded from regulation as a hazardous waste; (3) it is hazardous due to being: (a) identified or listed as hazardous waste; or (b) by exhibiting one or more characteristics of hazardous waste.[358] Currently, despite the hazardous chemicals contained in plastic, EPA does not consider plastic as falling within either listed or characteristic hazardous waste categories. However, given its broad RCRA mandate read in the context of more recent understanding about the hazards of plastic waste, EPA could consider plastic and, or as, microplastic for listing as hazardous waste or consider its potential to exhibit hazardous characteristics, as discussed below.

i. Listings and Characteristics: Microplastics as Hazardous Waste under RCRA

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[353] *See, e.g.*, Life Cycle Initiative, *National Guidance for Plastic Pollution Hotspotting and Shaping Action*, https://plastichotspotting.lifecycleinitiative.org/ (last visited Mar. 14, 2024).

[354] *See, e.g.*, 80 Fed. Reg. 21,302, 21,431 (April 17, 2015) (EPA's 2015 coal ash regulations that clarify that new open dumps are prohibited) (superseded after Congress amended the law to give EPA authority over coal ash even though it is solid, not hazardous, waste).

[355] Mary Ellen Ternes et al. Plastics Pollution Comment, *supra* note 140.

[356] 42 U.S.C. § 6945; 40 C.F.R. § 256.23.

[357] 42 U.S.C. § 6903(5).

[358] 40 C.F.R. § 261.3; *see also* 40 C.F.R. §§ 261.21–24 (defining the four RCRA hazardous waste characteristics; ignitability; corrosivity; reactivity; toxicity) and 40 C.F.R § 261.30 (defining the listed RCRA hazardous wastes).

In addition to taking action to address plastic and microplastic as solid waste through existing authority to mitigate open dumps of plastic and microplastic solid waste, a more aggressive approach EPA can pursue would be to holistically review which plastic waste should be identified and listed as hazardous waste,[359] which would qualify the material under RCRA Subtitle C jurisdiction.[360] EPA could consider plastic for regulation as either listed or characteristic hazardous waste under RCRA given the widely variable polymer types, chemical additive content, chemical leachability and microplastic production potential, which can pose risks similar to the monomers and their polymer chemical additives that are already considered hazardous. EPA needs no additional congressional authorization; EPA is required to "develop and promulgate criteria for identifying the characteristics of hazardous waste, and for listing hazardous waste, which should . . . tak[e] into account toxicity, persistence, and degradability in nature, potential for accumulation in tissue" among other related factors.[361] Based on this criteria, EPA must promulgate regulations, after notice and opportunity for public hearing, and revise the regulations "from time to time thereafter as may be appropriate."[362]

Due to overall plastic production, consumption, and leakage into the environment, microplastics are now ubiquitous in our environment and due to the "quantity, concentration, and physical chemical characteristics [plastics] may . . . pose a substantial present or potential hazard to human health and the environment when improperly treated, stored, transported or disposed of, or otherwise managed."[363] Microplastics often derive from larger plastics, which were likely discarded or otherwise "abandoned," even if through regulated processes such as disposal, burning, incineration or illegal processes, such as sham recycling.[364] Microplastics can also be released during use of a plastic product, such as tires releasing microplastic tireshred. As a solid waste, microplastics may also be categorized as a "inherently waste-like" because they are not captured, are abandoned, and thus are "ordinarily disposed of."

To list plastic and/or microplastic solid waste as hazardous wastes or define their characteristics such that they could be considered hazardous waste, EPA would need to review the more recently recognized hazards posed by plastic solid waste in the environment, in the context of RCRA's mandate. Pursuant to this RCRA mandate, EPA must consider how plastic solid waste, due to its: quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or

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[359] *See, e.g.,* Earthjustice Plastic Pollution Comments, *supra* note 201.
[360] U.S. ENVTL. PROT. AGENCY, RCRA ORIENTATION MANUAL 2014, III-29 (2014).
[361] 42 U.S.C. § 6921(a).
[362] 42 U.S.C. § 6921(b)(1).
[363] 42 U.S.C. § 6903(5); *see also* UNITED NATIONS ENV'T PROG., FROM POLLUTION TO SOLUTION; A GLOBAL ASSESSMENT OF MARINE LITTER AND PLASTIC POLLUTION 79 (2021) (finding both that plastics present a serious threat to all marine life, while also influencing the climate and that human health and well-being are at risk from the open burning of plastic waste, ingestion of seafood contaminated with plastics, and leaching out of substances of concern to coastal waters).
[364] *Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions#:~:text=Inherently%20Waste%2DLike%3A%20Some%20materials,include%20certain%20dioxin%2Dcontaining%20wastes (last visited Mar. 14, 2024).

incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, or transported, or disposed of, or otherwise managed. Specifically, EPA could consider, a minimum: the nature of plastic solid waste as a precursor for microplastic, which only enhances the leachability of chemical additives due to their larger surface area;[365] persistence, bioaccumulation potential and toxicity of plastic and its degradation product microplastic; and the role of plastic solid waste as a disease vector in the environment.[366] EPA can also begin immediate review of the toxic chemicals, including all the various polymers and additives, that can be found in plastic products and thus plastic solid waste, contemplating its proper context—such as the environmental fate and transport of plastic when discarded, including degradation into microplastic and enhanced leachability—which supports EPA's implementation of its RCRA mandate in the case of plastic solid waste.

ii. Listing Plastics and Plastic Additives Made with Toxic Classes of Chemicals as Hazardous Waste

Similar to the above discussion, EPA can immediately begin considering listing as hazardous waste any plastics and plastic additives created with toxic classes of chemicals, such as "ortho-phthalates, bisphenols, halogenated flame retardants, PFAS, heavy metals and compounds (including lead, hexavalent chromium, cadmium and mercury), perchlorate, formaldehyde, toluene, antimony and compounds, UV 328, and all other additives that are persistent, bioaccumulative, and toxic."[367] Though time- and resource-intensive, this option offers a targeted approach to accomplishing the objective of RCRA to "minimize the present and future threat to human health and the environment" caused by solid and hazardous waste management, treatment, and disposal.

As of the date of this report, EPA has already begun to act in alignment with the above-listed opportunity. In February 2024, EPA proposed to add "nine particular per- and polyfluoroalkyl compounds, their salts, and their structural isomers, to its list of hazardous constituents under 40 CFR Part 261, Appendix VIII."[368] Listing these chemical compounds is a "building block for any future work to regulates PFAS as a RCRA listed hazardous waste."[369]

[365] *See* Naixin Quian, et al., *Rapid Single-Particle Chemical Imaging of Nanoplastics by SRS Microscopy,* PNAS (Jan. 8, 2024); Corinne Purtill & Susanne Rust, *Researchers Discover Thousands of Nanoplastic Bits in Bottles of Drinking Water*, LA Times (Jan. 8, 2024).
[366] For more discussion, *see* RCRA ORIENTATION MANUAL 2014, *supra* note 360360, at III-17.
[367] *See* Earthjustice Plastic Pollution Comments, *supra* note 201.
[368] Listing of Specific PFAS as Hazardous Constituents, 89 Fed. Reg. 8,606 (Feb. 8, 2024).
[369] *Proposal to List Nine Per- and Polyflouroalkyl Compounds as Resource Conservation and Recovery Hazardous Constituents*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/hw/proposal-list-nine-and-polyfluoroalkyl-compounds-resource-conservation-and-recovery-act (last visited Mar. 14, 2024).

How the Resource Conservation and Recovery Act may be applied to Intervention 4, improve waste management through disposal, collection, and recycling improvements:
More thoroughly regulating the disposal of plastic, microplastics, and certain toxic polymers under RCRA would directly improve plastic disposal, collection, and recycling. Listing microplastics as hazardous waste under RCRA or characteristic hazardous waste would conceivably improve the regulatory framework for "cradle-to-grave"[370] responsibility for hazardous waste generators, including plastic producers. Listing certain toxic plastic polymers under RCRA could accomplish a more tailored approach towards the same objective.

How the Resource Conservation and Recovery Act may be applied to Intervention 5, capture plastic waste through removal from localized hotspots:
EPA may consider issuing guidance clarifying that areas where plastic waste has been intentionally dumped, negligently escaped, or has otherwise accumulated and resulted in plastic hotspots must be evaluated for identification as "open dumps," which are prohibited under RCRA section 4003(a).

iii. Procurement Requirements Favoring Products Made with Recovered Materials & Establishing Recommended Recovered Materials Content Levels for Plastic Materials

RCRA also directs the EPA Administrator to periodically publish, and revise if appropriate, guidelines for the procurement of items made with recovered or recycled content for qualifying federal agencies (Comprehensive Procurement Guidelines or CPG).[371] In the guidelines, EPA must:

> (1) designate those items which are or can be produced with recovered materials and whose procurement by procuring agencies will carry out the objectives of [RCRA's federal procurement section] . . . ; and
> (2) set forth recommended practices with respect to the procurement of recovered materials and items containing such materials and with respect to certification by vendors of the percentage of recovered materials used, and shall provide information as to the availability, relative price, and performance of such materials and items and where appropriate shall recommend the

[370] In the RCRA context, "cradle-to-grave" responsibility refers to the EPA's authority to control hazardous waste at every stage of its life cycle, including generation, transportation, treatment, storage, and disposal. See *Summary of the Resource Conservation and Recovery Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act (last visited Mar. 14, 2024).
[371] 42 U.S.C. § 6962(e).

> level of recovered material to be contained in the procured product . . . .[372]

Once EPA designates a product that is or can be produced with recovered materials—which means postconsumer materials, manufacturing, forest residues, and other wastes[373]—procuring agencies, when purchasing more than $10,000 worth of the designated product a year, must purchase the designated product "with the highest recovered material content practicable."[374] Procuring agencies include all federal agencies, and any state or local agency or government contractor that uses appropriated federal funds.[375] The goal of the CPG program is to promote the use of materials recovered from the municipal waste stream,[376] and the EPA has referred to it simply as the "federal buy-recycled program."[377]

EPA has developed eight broad categories for designated products and attendant recommendations for recovered material content.[378] Several of the recovered or recycling content recommendations touch and concern plastics and plastic material, such as plastic office products, plastic trash bags, and plastic fencing.[379]

EPA can consider "update[ing] the CPG to increase minimum requirements for post-consumer content across certain product categories" that already have existing post-consumer content standards.[380] By establishing recommended percentages of postconsumer content and total recovered materials content for products made with plastic material, EPA can conceivably help to generate demand for recycled and recovered materials for procuring agencies.

iv. Convening State Administrators of Extended Producer Responsibility Regimes to Determine Need for Agency Guidance

RCRA Subtitle D, an unfunded federal mandate, establishes the framework of authority for states, tribes, and local governments to manage nonhazardous municipal and industrial waste.[381] EPA's

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[372] *Id*.
[373] 42 U.S.C. § 6962(h).
[374] *Comprehensive Procurement Guideline (CPG) Program*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program (last visited Mar. 14, 2024); 48 C.F.R. § 23.400.
[375] *Id.* For example, if a county agency spends more than $10,000 a year on an EPA-designated item, and part of that money is from appropriated federal funds, then the agency must purchase that item made from recovered materials.
[376] *Id*.
[377] U.S. ENVTL. PROT. AGENCY, EPA COMPREHENSIVE PROCUREMENT GUIDELINE PROGRAM 1 (2007), https://www.epa.gov/sites/default/files/2016-02/documents/cpg-fs.pdf.
[378] *Id.* (including: 1) construction products; 2) landscaping products; 3) miscellaneous products; 4) nonpaper office products; 5) paper and paper products; 6) park and recreation products; 7) transportation products; and 8) vehicular products).
[379] U.S. ENVTL. PROT. AGENCY, EPA COMPREHENSIVE PROCUREMENT GUIDELINE PROGRAM 2 (2007), https://www.epa.gov/sites/default/files/2016-02/documents/cpg-fs.pdf
[380] Ocean Conservancy Plastic Pollution Comments, *supra* note 6666, at 12.
[381] 42 U.S.C. §§ 6941–6941.

RCRA-implementing regulations set forth the federal floor of criteria for the "operation of municipal waste and industrial waste landfills including design criteria, location restrictions, financial assurance, correction action, and closure requirements."[382] States, tribes, and local governments may receive authorization to administer a Subtitle D permit program upon a determination of adequacy by EPA, whereby an approved state receives authority to issue permits for regulated solid waste disposal facilities, subject to EPA criteria and all other applicable state law, regulation, and guidance.[383] Because microplastics, for example, are not currently regulated as a hazardous waste under RCRA, EPA could begin preliminary investigation into a national framework of extended producer responsibility (EPR) by convening stakeholders from the states that have: (1) approved Subtitle D programs; and (2) enacted EPR laws and/or guidance incorporated therein.

For example, California's Senate Bill No. 54 (Allen, 2022), approved by the California Governor and filed with the Secretary of State in June 2022, establishes, among other provisions, a "Plastic Pollution Prevention and Packaging Producer Responsibility Act," that is "designed to ensure that producers of single-use packaging and food service ware covered by the [EPR] program take responsibility for the costs associated with the end-of-life management of that material and sure that the material is recyclable or compostable."[384] This EPR mechanism requires "producers of plastic packaging and products to pay substantial sums to ensure proper management of packaging and waste as well as up to $5 billion over [ten] years for mitigation of impacts of plastic pollution, including to vulnerable or affected communities."[385]

Colorado has also enacted the "Producer Responsibility Program for Recycling," which "requires companies that sell products in packaging [and] paper products to fund a statewide recycling system to recycle those materials. These companies will form an independent non-profit organization, called a Producer Responsibility Organization [(PRO)], to coordinate, fund, and manage this statewide recycling program."[386]

In 2021, Oregon enacted the "Plastic Pollution and Recycling Modernization Act" to address the state's "outdated" recycling system. Under this law, obligated "producers" of "covered products" must register with a PRO that administers a state-approved producer responsibility program that will "fund improvements and ensure that collected recyclables go to responsible end markets."[387] Among other items, Oregon's Plastic Pollution and Recycling Modernization Act also established the

[382] *See Resource Conservation and Recovery Act (RCRA) Overview*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-overview (last visited Mar. 14, 2024) (discussing Subtitle D—non-hazardous waste).
[383] 40 C.F.R. pt. 239.
[384] Cal. Pub. Res. Code Div. 30, pt. 3, ch. 3.
[385] MBA Plastic Pollution Comments, *supra* note 293.
[386] *See Producer Responsibility Program*, CO. DEP'T PUB. HEALTH & ENV'T, https://cdphe.colorado.gov/hm/epr-program (last visited Mar. 14, 2024) (summarizing HB 22-1355).
[387] OR. DEP'T ENVTL. QUAL., PLASTIC POLLUTION AND RECYCLING MODERNIZATION ACT, FACTSHEET, https://www.oregon.gov/deq/recycling/Documents/recModORflyer.pdf (last visited Mar. 14, 2024).

"Truth in Labeling Task Force," which "stud[ies] and evaluate[s] misleading or confusing claims regarding the recyclability of products made on a product or packaging."[388]

How RCRA may be applied to Intervention 3, decreasing waste generation through extended producer responsibility requirements:
In convening stakeholders from states that have approved RCRA Subtitle D programs and EPR legislation, like those discussed above, EPA can examine how EPR mechanisms have fared in state laboratories to identify lessons learned and to determine whether the agency has a role to play in issuing guidance on this topic at the federal level.

v. RCRA as a Potential Proxy for the Basel Convention and Regulatory Gaps

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention), which entered into force in 1992, controls the international trade in hazardous wastes and certain other wastes.[389] This is directly relevant to improving the United States' international regime of plastic waste management, as will be discussed more thoroughly below. Among other provisions, the Basel Convention establishes a "prior informed consent" (PIC) regime "for the export of hazardous and certain other waste to importing countries."[390] The international trade of such hazardous and certain other wastes under the convention generally cannot occur without the importing country's PIC and the exporting country's confidence that the exported waste will be handled in an environmentally-sound manner.[391] Though the United States has not yet ratified the Basel Convention, the Senate provided its advice and consent to ratify the Basel Convention in 1992.[392]

The incumbent Bush Administration at the time the United States signed the Basel Convention cited a lack of regulatory authority to implement the objectives of the convention, specifically citing a need for: expanded EPA authority to "'prohibit shipments when the United States has reason to believe that the wastes will not be handled in an environmentally sound manner[;]' take-back

[388] *Truth in Labeling Task Force*, OR. DEP'T ENVTL. QUALITY, https://www.oregon.gov/deq/recycling/Pages/tiltaskforce.aspx (last visited Mar. 14, 2024); *see also* OREGON TRUTH IN LABELING TASK FORCE, TRUTH IN LABELING FINAL REPORT AND RECOMMENDATIONS SUBMITTED TO THE OREGON LEGISLATURE (June 1, 2022) (available at https://www.oregon.gov/deq/recycling/Documents/TIL-Report.pdf).
[389] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Mar. 22, 1989, 1673 U.N.T.S. 53.
[390] Tseming Yang & Scott Fulton, *The Case for U.S. Ratification of the Basel Convention on Hazardous Wastes*, 25 N.Y.U. ENVTL. L. J. 52, 65 (2017) (discussing Article 6 of the Convention).
[391] *Basel Convention on Hazardous Wastes*, U.S. DEP'T STATE, OFF. ENVTL. QUALITY, https://www.state.gov/key-topics-office-of-environmental-quality-and-transboundary-issues/basel-convention-on-hazardous-wastes/ (last visited Mar. 14, 2024).
[392] *Id*.; *see also* Center for Biological Diversity and Center for International Environmental Law, Petition to the United States Environmental Protection Agency Under the Federal Insecticide, Fungicide, and Rodenticide Act Regarding the Illegal Export of Dangerous Pesticides Unregistered in the United States (Mar. 8, 2023), https://www.biologicaldiversity.org/programs/environmental_health/pdfs/FIFRA-Petition-Section-17-March-2023.pdf (providing an overview of the United States' obligations to provide prior informed consent).

authority for illegally exported wastes[;] and authority to cover 'household wastes, ash from the incineration of those wastes, and wastes that are regarded as hazardous under the Convention but not under current U.S. law.'"[393]

The current status of the United States' ratification of the Basel Convention has remained the same for three decades under the theory that there is insufficient existing authority to implement the purposes and objectives of the Convention.[394] Generally, when international treaty provisions are not self-executing, additional domestic legal authority may be necessary to effectuate the agreement's provisions. Some scholars have argued, however, that the United States indeed has existing, albeit incomplete, legal authority to ratify the Basel Convention.[395]

As identified by authors Yang and Fulton in their article, *The Case for U.S. Ratification of the Basel Convention on Hazardous Wastes*, the United States has substantive authority under section 3017 of RCRA to implement the purpose of the Convention. These authors posit that EPA's RCRA authority already addresses the Convention's core principles: (1) environmentally sound management and; (2) PIC regime. RCRA section 3017 establishes RCRA's "Export of Hazardous Wastes" provision, which "prescribes a set of procedural requirements mandating prior notice and consent for the export of hazardous waste, similar to the requirements of the Convention."[396]

As a threshold matter, and as discussed in this report, RCRA already contemplates the environmentally sound management of hazardous substances and wastes (e.g., cradle-to-grave management). One of the enumerated objectives of RCRA "to promote the protection of health and the environment and to conserve valuable material and energy resources" is to be accomplished by "assuring that hazardous waste management practices are conducted in a manner in which protects human health and the environment."[397] Following the goal to reduce or eliminate hazardous waste is the national policy of RCRA to "treat, store, or dispose of hazardous waste that is nevertheless generated so as to minimize the present and future threat to human health and the environment."[398] These RCRA objectives closely mirror a prevailing aim of the Basel Convention to promote the "environmentally sound management of hazardous wastes or other wastes" to "protect human health and the environment against the adverse effects of such hazardous wastes."[399]

Similarly, RCRA already includes a notification requirement for exporters of hazardous waste that could conceivably accomplish the Basel Convention's PIC regime. Section 3017(a)(1) establishes a default notification requirement, by which any exporter of hazardous waste identified or listed under RCRA must notify and provide the EPA Administrator with relevant information including: "1)

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[393] Yang & Fulton, *supra* note 390390390, at 65.
[394] *Basel Convention on Hazardous Wastes*, *supra* note 389.
[395] *See generally*, Yang & Fulton, *supra* note 390; *see also* EPA DRAFT NATIONAL STRATEGY TO PREVENT PLASTIC POLLUTION, *supra* note 28, at 29 (explaining that the "United States should explore options for strengthening U.S. participation in the Basel Convention, including options that would enable ratification").
[396] *Id*. at 77; 42 U.S.C. § 6938(a)–(d).
[397] 42 U.S.C. § 6902(a)(4).
[398] 42 U.S.C. § 6902(b).
[399] *Basel Convention: Overview,* UNITED NATIONS ENV'T PROGRAMME, https://www.basel.int/theconvention/overview/tabid/1271/default (last visited Mar. 14, 2024).

the name and address of the exporter; 2) the types and estimated quantities of hazardous waste to be exported; 3) the estimated frequency or rate at which such waste is to be exported; and the period of time over which such hazardous waste is to be exported; 4) the ports of entry; 5) a description of the manner in which such hazardous waste will be transported to and treated, stored, or disposed in the receiving country; and 6) the name and address of the ultimate treatment, storage or disposal facility."[400] Section 3017(a)(2), however, also permits the export of hazardous waste if "the [U.S.] and the government of the receiving country have entered into an agreement as provided for in subsection (f) and the shipment conforms with the terms of such agreement."[401]

The default RCRA notification provision is a very close analog to the requirements under the Basel Convention, albeit the latter boasts slightly more detail than what RCRA requires (i.e., information regarding the reason for the waste export; intended carrier(s) of the waste or their agents, if known; information relating to insurance; process by which the waste is generated) and otherwise requires information relevant only to the multilateral nature of the agreement (i.e. designation and physical description of the waste including Y number and UN number and its composition and information on any special handling requirements including emergency provisions in the case of accidents).[402]

Aside from the likely sufficiency of the United States' existing notification authority under RCRA's hazardous waste export provision that would foreclose the need for additional legal authority to ratify this Convention provision, section 3017 nevertheless contemplates instances where the default notification provision would be substituted "where an international agreement between the United States and the government of the receiving country [exists that] establish[es] notice, export, and enforcement procedures for the transportation, treatment, storage, and disposal of hazardous wastes."[403] For this reason, should the United States ratify the Basel Convention, "[s]ection 3017 would automatically adopt the notice and consent requirements of the Basel Convention."[404]

One significant hurdle in the application of RCRA as a proxy for the Basel Convention is that the definitions of hazardous wastes in RCRA are not coterminous with those of the Basel Convention. The latter lists hazardous wastes and other wastes in its Annexes that govern "waste streams, hazard characteristics, and constituent components."[405] The former's implementing regulations define and exclude certain hazardous wastes. As authors Yang and Fulton identify, instances could arise where a certain hazardous waste is covered under the Basel Convention but not under RCRA's 3017 authority, resulting in a regulatory gap.

One solution to this potential hurdle would be for the United States—should it use RCRA as a proxy for the Basel Convention—to continue to enter into Article 11 agreements, under which negotiated

[400] 42 U.S.C. § 6938(c).
[401] 42 U.S.C. § 6938(a)(2).
[402] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal annex V A, Mar. 22, 1989, 1673 U.N.T.S. 53 (emphasis added).
[403] 42 U.S.C. §§ 6938(a)(2), 6938(f).
[404] Yang & Fulton, *supra* note 390, at 78.
[405] *Id*. at 80.

terms for non-RCRA hazardous waste could be exempted from the Convention, with other Annex VII parties.[406] Ideally, however, EPA could initiate a comprehensive interagency review to identify how to reconcile the disconsonant definitions of hazardous waste under the Convention and RCRA. This would be a necessary first step in the potential ratification of the Convention.

How RCRA may be applied to Intervention 4, improving waste management through plastic waste import/export controls:
EPA has existing authority under RCRA to control plastic waste import and export. RCRA may serve as a useful starting point as a proxy for the ratification of the Basel Convention. For example, importers and exporters of hazardous waste must comply with RCRA's notification requirements. RCRA's prior notice and consent for the export of RCRA-identified hazardous waste are also comparable to the Basel Convention's (Convention's) export notice requirements. However, additional statutory revisions would be needed to fully use RCRA as a proxy for the Convention given the differing definitions of "hazardous waste(s)" between these two authorities.

vi. Sustainable Materials Management Initiative

RCRA also enables EPA's Sustainable Materials Management (SMM) initiative: EPA's effort to reduce the environmental impacts of materials across their life cycle.[407]

EPA promotes SMM as a systematic approach to using and reusing materials more productively over their entire life cycle.[408] While plastic waste is highlighted by the program, it is generally addressed in the context of SMM and not as a subtopic in and of itself.[409] Through this program EPA has collaborated with states and territories to incorporate SMM as an important strategic approach for addressing environmental challenges. The goals of the SMM approach are to: use materials in the most productive way with an emphasis on using less; reduce toxic chemicals and environmental impacts throughout the material life cycle; and assure we have sufficient resources to meet today's needs and those of the future.[410] The agency examines how materials are used throughout their life cycles and provides tools and other resources through the program, such as Sustainable Materials

[406] *Id*. at 81.
[407] U.S. ENVTL. PROT. AGENCY, RCRA'S CRITICAL MISSION & THE PATH FORWARD (Jun. 2014), https://www.epa.gov/sites/default/files/2015-09/documents/rcras_critical_mission_and_the_path_forward.pdf; Additionally, EPA's Draft National Strategy to Prevent Plastic Pollution was, in part, a response to the Save Our Seas 2.0 Act's directive to create an SMM strategy.
[408] *Sustainable Materials Management Basics*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/smm/sustainable-materials-management-basics (last visited Mar. 14, 2024).
[409] *See generally*, *Sustainable Materials Management*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/smm (last visited Mar. 14, 2024).
[410] *Id.*

Management Tools, a Waste Reduction Model, the State Data Measurement Sharing Program (which has been paused), assessment tools, fact sheets, and reports.[411]

In EPA's Draft National Strategy to Prevent Plastic Pollution, the agency emphasizes that the SMM approach has been integrated into its work since 2009, since the publication of *EPA's Sustainable Materials Management: The Road Ahead*.[412] As stated in EPA's Draft National Strategy to Prevent Plastic Pollution, "a circular economy approach under the SMM umbrella demonstrates continuity in EPA's emphasis on reducing the life cycle impacts of materials, reducing the use of harmful materials, and decoupling materials use from economic growth."[413]

How the Sustainable Materials Management Program may be applied to Intervention 4, improving waste management through disposal, collection, and recycling improvements:
The Sustainable Materials Management Program primarily serves as a collaborative platform as well as a measurement and assessment tool that supports a systematic approach to using and reusing materials more productively over their entire life cycle. As EPA prioritizes its National Strategy to Prevent Plastic Pollution, the agency can utilize the SMM program resources to analyze information and provide resources to promote waste reduction, collection, disposal, and recycling improvements.

vii. Waste Reduction Model

EPA's Office of Resource Conservation and Recovery (ORCR) implements RCRA and manages several related initiatives including the Waste Reduction Model (WARM), which supports the approach to a circular economy.[414] EPA launched WARM in 1998, and the initiative has been updated and expanded fifteen times since its launch, with the sixteenth update currently undergoing public review and comment.[415] In 2022 and 2023, WARM underwent an external peer review and a data quality assessment as part of the EPA's ongoing efforts to ensure WARM's scientific integrity.[416]

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[411] *See generally*, *Sustainable Materials Management Tools*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/smm/sustainable-materials-management-tools#WARM (last visited Mar. 14, 2024); *Facts and Figures about Materials, Waste and Recycling*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling (last visited Mar. 14, 2024).

[412] EPA DRAFT NATIONAL STRATEGY TO PREVENT PLASTIC POLLUTION, *supra* note 28, at 14.

[413] *Id*.

[414] *EPA's Office of Resource Conservation and Recovery*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/aboutepa/epas-office-resource-conservation-and-recovery-orcr (last visited Mar. 14, 2024). A circular economy keeps materials and products in circulation for as long possible. . . . A circular economy reduces material use, redesigns materials and products to be less resource intensive, and recaptures "waste" as a resource to manufacture new materials and products. *What is a Circular Economy*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/circulareconomy/what-circular-economy (last visited Mar. 14, 2024).

[415] Waste Reduction Model (WARM) Version 16: Requestion for Public Comment, 88 Fed. Reg. 88,913 (Dec. 26, 2023).

[416] *Id.*

EPA's WARM is a digital tool can be used either as a software program or a downloadable excel sheet. WARM allows its users to compare baseline waste management practices and several different alternatives for a given waste stream (based on user-inputted data). The waste management practices that the tool currently includes are source reduction, recycling, composting, anaerobic digestion, combustion, and landfilling.[417]

When comparing these practices to the baseline in a given context, WARM can provide high-level estimates of potential greenhouse gas (GHG) emissions reductions, as well as energy savings and economic impacts. The model makes these assessments based on the breakdown of material in the waste stream inputted by the user. WARM currently recognizes 60 different types of material, including eight types of plastics. The tool can be used by individuals, researchers, organizations, businesses, and local, state, and federal government officials.[418]

EPA also has a couple of companion tools to WARM. The Recycled Content (ReCon) tool was developed for purchasers and "calculates the benefits of alternative recycled content purchasing decisions."[419] The Policy and Program Impact Estimator, an Excel spreadsheet calculator, expands on the WARM framework and "is designed to help municipalities, counties, and tribes estimate reductions in life cycle GHGs from implementing new or expanded solid waste policies and programs in their communities," by taking into account the community's existing waste stream and its policy and program options.[420]

How the Waste Reduction Model may support the interventions through education and outreach activities:
The WARM tool, as well as the ReCon tool and the Policy and Program Impact Estimator calculator, could be used to evaluate the environmental and economic benefits of alternative policy options to improve disposal, collection, and recycling of plastics. Specifically, it could be used to illustrate the effects of plastics in the waste stream, and/or to compare the various waste management options for plastics.

6. National Environmental Policy Act

[417] *Basic Information about the Waste Reduction Model (WARM)*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/warm/basic-information-about-waste-reduction-model-warm (last visited Mar. 14, 2024); Under the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law, EPA is directed to develop several new solid waste recycling programs. *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 1404.
[418] *Id.*
[419] *Recycled Content (ReCon) Tool*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/warm/recycled-content-recon-tool (last visited Mar. 14, 2024).
[420] *Policy and Program Impact Estimator: A Materials Recovery Greenhouse Gas (GHG) Calculator for Communities*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/warm/policy-and-program-impact-estimator-materials-recovery-greenhouse-gas-ghg-calculator (last visited Mar. 14, 2024).

The National Environmental Policy Act (NEPA) may serve as a very limited federal lever to address plastic pollution. NEPA is, broadly, a procedural mandate with substantive, action-forcing provisions. Under NEPA, federal agencies must consider the impacts of all proposed "major Federal actions significantly affecting the quality of the human environment."[421] Though these impacts need not be elevated above other considerations, federal agencies must still take a "'hard look at environmental consequences' of their proposed actions, consider alternatives, and publicly disseminate such information before taking final action."[422] The scope of federal actions that may trigger NEPA review varies considerably, but generally includes the issuance of permits and expansion of infrastructure.[423]

NEPA also created the Council on Environmental Quality (CEQ), which promulgates implementing regulations and issues guidance for the administration of NEPA.[424] Compliance with NEPA and its implementing regulations "routinely involves [the] disclos[ure of] any disproportionate impacts on communities with environmental justice concerns, including cumulative impacts, along with consideration of ways to address (i.e., avoid or reduce) those impacts."[425]

a. Examining Cumulative Impacts of Plastics

i. EPA's NEPA Compliance

NEPA review is generally only triggered for a limited number of EPA actions. These actions include "certain research and development activities; construction of EPA facilities; Title II wastewater treatment construction grants under section 201 of the CWA; water and wastewater infrastructure projects funded under the Water Infrastructure Finance and Innovation Act of 2014; EPA-issued NPDES permits for new sources under section 306 of the CWA; and certain projects funded through EPA annual appropriations acts."[426] Notably, many EPA actions are exempt from NEPA requirements under section 511(c) of the CWA and all EPA actions under the CAA through section 7(c) of the Energy Supply and Environmental Coordination Act of 1974.[427] For those EPA actions that do trigger NEPA review, EPA must either apply a categorical exclusion (CE) or prepare an environmental assessment (EA) or environmental impact statement (EIS). The CEQ Regulations and EPA's 1996 environmental justice-NEPA guidance specifically direct EPA

> to examine not only the direct and indirect effects of the EPA action on communities with environmental justice concerns but also the cumulative impacts of the action when added to other past, present,

[421] 42 U.S.C §§ 4321–4370m-12.
[422] NINA M. HART & LINDA TSANG, CONG. RESEARCH SERV. IF 11549, THE LEGAL FRAMEWORK OF THE NATIONAL ENVIRONMENTAL POLICY ACT 1 (Sept. 22, 2021) (quoting and citing Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350 (1989)).
[423] KRISTEN HITE, CONG. RESEARCH SERV. LSB11008, ENVIRONMENTAL JUSTICE AND THE NATIONAL ENVIRONMENTAL POLICY ACT 1 (July 19, 2023).
[424] 40 C.F.R. pts. 1500–1508.
[425] EPA LEGAL TOOLS TO ADVANCE ENVIRONMENTAL JUSTICE: CUMULATIVE IMPACTS ADDENDUM, *supra* note 175.
[426] *EPA Compliance with the National Environmental Policy Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/nepa/epa-compliance-national-environmental-policy-act (last visited Mar. 14, 2024).
[427] *Id*.

> and reasonably foreseeable future activities (federal and non-federal). This should include climate-related cumulative impacts on communities with environmental justice concerns.[428]

This examination of climate-related cumulative effects of the EPA action—specifically with respect to environmental justice concerns—can conceivably implicate, for example, petrochemical manufacturing and processing activities. Increasing demand for plastics may further entrench U.S. dependency on fossil fuel extraction and burning.[429] The climate impacts of continuous fossil fuel dependency may likely exacerbate environmental injustices.[430] A reasonable extension of this argument, then, is that EPA could examine the role that the cumulative impacts of plastics (including pollution from plastic production) play on communities with environmental justice concerns when conducting its NEPA reviews. This analysis could consider not only the location and environmental and human health impacts of petrochemical manufacturing and processing facilities, but any proposed "solution" to addressing the plastics pollution crisis—such, as "advanced" or "chemical" recycling facilities.[431]

How NEPA may be applied to Intervention 1, reducing plastic production and pollution from production through regulation of production capacity and associated pollution:
U.S. federal agencies, such as the EPA, can consider how plastic and petrochemical manufacturing facilities as well as proposed solutions to plastic production (i.e., chemical recycling) implicate human health and environmental justice concerns in their cumulative impacts analysis for actions that trigger NEPA reviews. This may arise in the siting processes of plastic production or manufacturing facilities.

7. Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund")

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—often referred to as "Superfund"—confers to EPA broad authority to respond to releases or threatened releases of hazardous substances as well as pollutants and contaminants. CERCLA includes provisions governing: the removal and remediation of hazardous substances, pollutants, and contaminants; a scheme of liability for persons responsible for the release of hazardous substances; and a trust fund to finance hazardous substance clean up when a responsible party cannot be identified. Compared to the proactive programs as seen in RCRA, CERCLA generally contemplates a more retrospective approach, establishing a statutory response by a release or substantial threat of release of hazardous of substances, pollutants, or contaminants. At the same time, however,

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[428] EPA LEGAL TOOLS TO ADVANCE ENVIRONMENTAL JUSTICE ADDENDUM: CUMULATIVE IMPACTS ADDENDUM, *supra* note 175, at 5.

[429] *See, e.g., Confronting Climate Change*, OCEAN CONSERVANCY, https://oceanconservancy.org/climate/plastics-climate/ (last visited Mar. 14, 2024).

[430] *Id*.

[431] *See* EPA DRAFT NATIONAL STRATEGY TO REDUCE PLASTIC POLLUTION, *supra* note 28, at 15 (reaffirming EPA's position that "the Agency does not consider activities that convert non-hazardous solid waste to fuels or fuel substitutes ("plastics-to-fuel") or for energy production to be "recycling" activities" (i.e., chemical recycling)).

CERCLA does have an ex-ante effect in promoting proper management of substances that fall under CERCLA because parties may wish to avoid future CERCLA liability that could result from improper management.

Hazardous substances under CERCLA include, but are not limited to, those contaminants listed as toxic pollutants under the CWA.[432] Yet untested, plastic, particularly microplastic, could be addressed pursuant to CERCLA authority to remediate pollutants and contaminants.[433] Related to the above discussion of levers available under the CWA, should EPA exercise its authority under CWA section 307 to list additional toxic pollutants most commonly used in plastic production, the agency could conceivably serve the dual purpose of ensuring that the release or threatened release of those CERCLA-defined hazardous substances—as well as microplastic pollutants or contaminants—could be appropriately addressed via removal and remediation. EPA has already begun to take steps to accomplish this goal, in part, through its April 2023 issuance of an Advance Notice of Proposed Rulemaking, through which the Agency requested public feedback on the potential hazardous substance designation of PFAS, a plastic additive, under CERCLA.[434]

From this perspective, EPA can consider its authorities under CERCLA as applicable to NASEM Intervention 5 generally to remediate waste. EPA's enforcement authority under CERCLA against potentially responsible parties may pose an indirect incentive on plastic producers in their calculations of profitability to avoid, rather than absorb, the costs of liability for releases of hazardous substances. Simply, the burden of liability could conceivably dissuade plastic producers to include hazardous chemicals in the production process from the outset.

How CERCLA may be applied to Intervention 5, capturing waste by removing plastic waste from localized hotspots:
Should EPA update its CWA the Toxic Pollutant List and Priority Pollutant List, additional "back-end" levers would be available under CERCLA to remediate the release of hazardous substances, pollutants, and contaminants.

Under CERCLA, the Agency for Toxic Substances and Disease Registry (ATSDR) collaborates with EPA and the Centers for Disease Control and Prevention (CDC), among other state and federal partners,

[432] 42 U.S.C. § 9601(14).
[433] *See, e.g.*, U.S. ENVTL. PROT. PROGRAM, TERN ISLAND PRELIMINARY ASSESSMENT TECHNICAL SUPPORT DOCUMENT (2013) (responding to the Center for Biological Diversity's 2012 rulemaking petition to conduct a Preliminary Assessment (PA) under CERCLA for the Northwestern Hawaiian Islands (NWHI) "with the goal of assessing the impacts of marine debris on threatened and endangered species," EPA partnered with U.S. Fish and Wildlife in 2013 to the conduct PA that examined "the release of hazardous substances from Tern Island [which comprises part of the NWHI], including hazardous substances that adsorb to plastic marine debris in the surrounding surface water." PAs are limited-scope investigations authorized under CERCLA through which EPA or authorized states collect readily available information to "evaluate releases of hazardous substances, pollutants, or contaminants that may pose a threat to human health and the environment.").
[434] 88 Fed. Reg. 22,399 (April 13, 2023).

to "establish and maintain inventory of literature, research, and studies on the health effects of toxic substances."[435] This part of CERCLA is discussed in the Agency for Toxic Substances and Disease Registry section below, which reviews authorities relevant to the Department of Health and Human Services.[436]

8. Emergency Planning and Community Right-to-Know Act

The Emergency and Community Right-to-Know Act (EPRCA) was enacted to help communities plan for chemical emergencies, enhance public access to information about chemicals at individual facilities, and otherwise promote public safety.[437] EPCRA is relevant to plastics regulation because it requires many facilities in the plastics industry to report on how they store, process, use, and handle hazardous chemicals inherent to plastic production. These hazardous chemicals in the plastics industry include PFAS and plastic resins like polyethylene and polypropylene.

The core of EPCRA is the Toxic Release Inventory (TRI), a reporting system designed to provide the EPA and the public with information about the release and management of certain toxic chemicals by industrial facilities.[438] The TRI program focuses on more than 650 toxic chemicals that have been identified as harmful to human health and the environment. This list of toxic chemicals comes from a predetermined list Congress created when it passed EPCRA. However, the law gives the EPA Administrator power to add chemicals if the chemical "is known to cause or can reasonably be anticipated to cause significant adverse acute human health effects" or because of its "toxicity and persistence in the environment."[439] The TRI includes several chemicals used in plastics and plastic production, such as vinyl chloride, styrene, toluene.[440]

In 2019, Congress also passed an amendment to EPCRA instructing the EPA to list most forms of PFAS on the TRI.[441] The amendment immediately added nine types of PFAS to the TRI,[442] created a framework for the automatic addition of PFAS to the TRI whenever EPA regulated a type of PFAS through TSCA,[443] and instructed EPA to evaluate remaining forms of PFAS over the succeeding two years.[444] In June 2023, EPA issued a final rule updating the TRI to add an additional nine new PFAS substances.[445] The total types of PFAS subject to TRI reporting is now 189.[446]

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[435] 41 U.S.C. § 9604(i)(1)(B).
[436] *See infra* ELI Report, at Section IV(N).
[437] *See* 42 U.S.C. § 11001.
[438] *What is the Toxics Release Inventory*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/toxics-release-inventory-tri-program/what-toxics-release-inventory (last visited Mar. 14, 2024).
[439] 42 U.S.C. § 11023(d)(2).
[440] U.S. ENVTL. PROT. AGENCY, EPCRA SECTION 313 CHEMICAL LIST FOR REPORTING YEAR 2022, https://www.epa.gov/system/files/documents/2023-07/ry-2022-rfi-chemical-list-03-07-2023_1.pdf.
[441] National Defense Authorization Act for Fiscal Year 2020, 15 U.S.C. § 8921 (2019).
[442] 15 U.S.C. § 8921(b).
[443] 15 U.S.C. § 8921(c).
[444] 15 U.S.C. § 8921(d).
[445] *EPA Requires Reporting on Releases and Other Waste Management for Nine Additional PFAS,* U.S. ENVTL. PROT. AGENCY (Jan. 6, 2023), https://www.epa.gov/newsreleases/epa-requires-reporting-releases-and-other-waste-management-nine-additional-pfas.
[446] *Id*.

The TRI requires facilities that "manufacture[], process[], or otherwise use" these toxic chemicals in amounts above designated thresholds to file annual reports with the EPA and state environmental agencies.[447] In these reports, the facilities must detail:

> (i) "Whether the toxic chemical at the facility is manufactured, processed, or otherwise used, and the general category or categories of use of the chemical.
> (ii) An estimate of the maximum amounts (in ranges) of the toxic chemical present at the facility at any time during the preceding calendar year.
> (iii) For each wastestream, the waste treatment or disposal methods employed, and an estimate of the treatment efficiency typically achieved by such methods for that wastestream.
> (iv) The annual quantity of the toxic chemical entering each environmental medium."[448]

The data collected through these forms is made publicly available through the TRI National Analysis, and online database that allows users to search and analyze information about chemical releases and waste management practices.[449]

Beyond the TRI, EPCRA also mandates that facilities assist communities in emergency preparedness by providing state and local emergency response agencies with information about their hazardous chemicals and their dangerous properties.[450] Under this portion of the law, plastics manufacturers must submit information about plastic resins like polyethylene and polypropylene because the EPA classifies them as "combustible dusts."[451]

Despite the lack of any strict command-and-control-type mandates, EPCRA's disclosure requirements have successfully incentivized manufacturing facilities to reduce the release of toxic chemicals into the environment.[452] From 1988 (when the EPA implemented the TRI program) to 2008, the EPA reports that manufacturing facilities decreased their total disposal or other releases of toxic chemicals by 65 percent.[453] Therefore, while EPRCA is primarily concerned with toxic chemicals rather than plastics generally, the law's disclosure requirements play an important role in reducing the disposal or discharge of some of the toxic byproducts of plastics manufacturing.

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[447] 42 U.S.C. § 11023(a).
[448] 42 U.S.C. § 11023(g).
[449] *TRI National Analysis,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/trinationalanalysis (last visited Mar. 14, 2024).
[450] 42 U.S.C. §§ 11022–11023.
[451] *Emergency Planning and Community Right-to-Know Act (EPCRA): Plastic Resins and EPCRA Section 311/312 Reporting,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/epcra/plastic-resins-and-epcra-section-311-312-reporting (last visited Mar. 14, 2024).
[452] ZYGMUNT PLATER ET AL., ENVIRONMENTAL LAW AND POLICY: NATURE, LAW, AND SOCIETY 338 (5th ed. 2016).
[453] U.S. ENVTL. PROT. AGENCY, TOXICS RELEASE INVENTORY (TRI) NATIONAL ANALYSIS (Dec. 2009), https://www.epa.gov/sites/default/files/2018-12/documents/2008_tri_national_analysis_overview_brochure.pdf.

How EPCRA may be applied to Intervention 4, improving waste management through disposal, collection, and recycling improvements:
Under EPCRA, plastics manufacturing facilities must report information on their use, storage, and disposal of toxic chemicals such as PFAS and plastic resins. These public disclosure requirements have incentivized plastics facilities to improve waste management and reduce their disposal or discharge of chemicals into the environment. Additionally, EPCRA empowers the EPA to add more chemicals to the Toxic Release Inventory (TRI)—thereby mandating EPCRA's disclosure requirements—if the chemical "is known to cause or can reasonably be anticipated to cause significant adverse acute human health effects" or because of its "toxicity and persistence in the environment."[454] The ability to update the TRI provides the EPA a potential lever to expand EPCRA's reach without additional congressional authorization when necessary.

How EPCRA may support the interventions through information and/or data collection activities:
EPCRA's public disclosure requirements also provide valuable sources of data on the use, storage, and disposal of toxic chemical such as PFAS and plastic resins.

9. Marine Protection Research and Sanctuaries Act of 1972 (known as the Ocean Dumping Act), as amended by the Ocean Dumping Ban Act of 1988

The Marine Protection, Research, and Sanctuaries Act (MPRSA),[455] otherwise known as the Ocean Dumping Act, was enacted in 1972 to regulate the dumping of all materials that would adversely affect human health, welfare or amenities, or the marine environment, ecological systems or economic potentialities.[456] "Dumping" is generally defined as "a disposition of material"[457] and "material" is defined as

[454] 42 U.S.C. § 11023(d)(2).

[455] 16 U.S.C. §§ 1431–1445c-1 (addressing marine sanctuaries and administered by NOAA); 33 U.S.C. § 1401–1470 (administered by EPA).

[456] *Learn about Ocean Dumping*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/ocean-dumping/learn-about-ocean-dumping (last visited Mar. 14, 2024).

[457] 33 U.S.C. 1402(f) ("Dumping" means a disposition of material: *Provided*, That it does not mean a disposition of any effluent from any outfall structure to the extent that such disposition is regulated under the provisions of the Federal Water Pollution Control Act, as amended [33 U.S.C. 1251 et seq.], under the provisions of section 407 of this title, or under the provisions of the Atomic Energy Act of 1954, as amended [42 U.S.C. 2011 et seq.], nor does it mean a routine discharge of effluent incidental to the propulsion of, or operation of motor-driven equipment on, vessels: Provided, further, That it does not mean the construction of any fixed structure or artificial island nor the intentional placement of any device in ocean waters or on or in the submerged land beneath such waters, for a purpose other than disposal, when such construction or such placement is otherwise regulated by Federal or State law or occurs pursuant to an authorized Federal or

> matter of any kind or description, including, but not limited to, dredged material, solid waste, incinerator residue, garbage, sewage, sewage sludge, munitions, radiological, chemical, and biological warfare agents, radioactive materials, chemicals, biological and laboratory waste, wreck or discarded equipment, rock, sand, excavation debris, and industrial, municipal, agricultural, and other waste; but such term does not mean sewage from vessels within the meaning of section 1322 of this title . Oil within the meaning of section 1321 of this title shall be included only to the extent that such oil is taken on board a vessel or aircraft for the purpose of dumping.[458]

Titles I and II of MPRSA generally prohibit the transportation of material from the United States for the purpose of ocean dumping, transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels, and dumping of material transported from outside the United States into the U.S. territorial sea.[459] A permit is required to deviate from these prohibitions. Under MPRSA, the standard for permit issuance is whether the dumping will "unreasonably degrade or endanger" human health, welfare, or the marine environment.[460] The EPA is charged with developing ocean dumping criteria to be used in evaluating permit applications.[461]

MPRSA implements the requirements of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972, known as the London Dumping Convention, and its

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State program: And provided further, That it does not include the deposit of oyster shells, or other materials when such deposit is made for the purpose of developing, maintaining, or harvesting fisheries resources and is otherwise regulated by Federal or State law or occurs pursuant to an authorized Federal or State program.").

[458] 33 U.S.C. 1402(c).

[459] *Summary of the Marine Protection, Research, and Sanctuaries Act*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/laws-regulations/summary-marine-protection-research-and-sanctuaries-act (last visited Mar. 14, 2024).

[460] *Id*.

[461] *Id*. EPA's ocean dumping regulations are published at 40 C.F.R. pts. 220–229 and include the criteria and procedures for ocean dumping permits and for the designation and management of ocean disposal sites under the MPRSA. In addition, the Corps has published regulations under various provisions of 33 C.F.R. pts. 320, 322, 324, 325, 329, 331, and 335–337. Notably, the EPA, along with the U.S. Army Corps of Engineers (USACE), National Oceanic and Atmospheric Administration (NOAA), and the U.S. Coast Guard (USCG) are responsible for implementing MPRSA. *Learn about Ocean Dumping*, *supra* note 456. EPA has primary authority for regulating ocean disposal of all materials except dredged materials. USACE and EPA share responsibility for the regulation of dredged material disposal in the ocean. *Id.* USCG maintains surveillance of ocean dumping. Under Title II of the MPRSA, NOAA is responsible for some long-range research on the effects of human-induced changes to the marine environment. *Id.* In addition, EPA's Ocean Dumping Management Program coordinates with partners at the international, federal, state, and local levels, and through interagency groups, including National and Regional Dredging Teams, on ocean dumping, dredged material management, pollution prevention and marine protection activities. *Id.*

successor, the London Protocol.[462] The London Convention is one of the first international agreements for the protection of the marine environment from human activities and prohibits the dumping of persistent plastics among other wastes.[463]

The Ocean Dumping Ban Act of 1988[464] amended MPRSA to prohibit the ocean dumping of municipal sewage sludge and industrial wastes, such as wastes from plastics and pharmaceutical manufacturing plants and from petrochemical refineries.[465] In addition, MPRSA and EPA's ocean dumping regulations prohibit ocean dumping of certain materials, such as persistent inert synthetic or natural materials, which may float or remain in suspension in the ocean causing interference with fishing navigation or other legitimate uses of the ocean.[466]

How the Marine Protection Research and Sanctuaries Act may be applied to Intervention 6, minimizing ocean disposal through increasing enforcement and reducing at-sea abandonment or discard of fishing gear:
Under MPRSA and the Ocean Dumping Ban Act of 1988, EPA and the coordinating agencies are responsible for enforcing the prohibition of the dumping of wastes from plastics and petrochemical refineries, as well as synthetic or natural plastic materials into the oceans.[467] EPA could improve its ocean dumping criteria and permit requirements in ways that will continue to address and prohibit all forms of plastic waste pollution.[468]

10. Pollution Prevention Act

The Pollution Prevention Act of 1990 (P2 Act) establishes a "national policy of the United States that pollution should be prevented or reduced at the source whenever feasible."[469] Specifically, the law calls for source reductions of "any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment."[470] The law's approach primarily depends on the creation of EPA-led capacity building programs and grantmaking. For example, the law also authorizes the EPA to develop strategies to promote wider voluntary adoption of source reduction strategies,[471] gather and share information on source reduction techniques,[472] and issue technical assistance grants for source reduction programs.[473]

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[462] *Learn about Ocean Dumping*, *supra* note 456 (note, the U.S. has not ratified the Convention or Protocol but does participate in meetings).
[463] *Id*.; CLAUDIA COPELAND, CONG. RESEARCH SERV., RS20028, OCEAN DUMPING ACT: A SUMMARY OF THE LAW, 4 (Dec. 15, 2010).
[464] Pub. L. No. 100-688, tit. I (1988).
[465] *Learn about Ocean Dumping*, *supra* note 456.
[466] *Id*.
[467] *Id*.
[468] *See id*.
[469] 42 U.S.C. § 13101(b).
[470] 42 U.S.C. § 13101(5)(A)(i).
[471] 42 U.S.C. § 13103(b).
[472] 42 U.S.C. § 13105.
[473] 42 U.S.C. § 13104.

This section will describe the EPA's current programs under the P2 Act that are relevant to plastic pollution mitigation—namely the Safer Choice Program and the Pollution Prevention Grant Program—before describing how the EPA could use expand its P2 Act programs to target plastic pollution more directly.

a. Safer Choice Program and Standards

EPA's Safer Choice Program is part of the agency's Pollution Prevention (P2) programs (i.e., those programs specifically enacted under the P2 Act's authorities). The Safer Choice Program encourages industry to practice "safer and greener chemistry in the marketplace to safeguard human health and protect the environment."[474] Through the Safer Choice Program, EPA has established a "Safer Choice" label for a variety of products. The label informs consumers that a given product meets the agency-established "Safer Choice Standard" (soon to be retitled "Safer Choice and Design for the Environment (DfE) Standard"). Companies must meet specific Safer Choice Standard criteria for their product to earn the certification. Typically, this involves demonstrating that each of the ingredients in the product "is among the safest in its ingredient class" and that "the product as a whole has [met] safety criteria, qualif[ied] as high-performing, and [has been] packaged in an environmentally friendly manner."[475]

The authority for EPA's Safer Choice Program derives from: (1) section 6604(b)(5) of the Pollution Prevention Act, which authorizes EPA to "facilitate the adoption of source reduction techniques by businesses;" and (2) section 102(2)(G) of the National Environmental Policy Act "to provide advice and information available to units of government, institutions and individuals that may be used to restore, maintain, and enhance the quality of the environment."[476]

On November 14, 2023, EPA issued proposed modifications to the Safer Choice Standard. Among other new requirements, EPA is proposing to add a requirement that "packages must either be recyclable and made of a certain percentage of recycled content per the FTC Green Guides or be designed to be reused."[477] EPA is also proposing to require that product manufacturers "include clear instructions, or a link to online instructions, on the [product's] packaging regarding how to recycle [the product]."[478] Notably, EPA is also proposing changes to the primary packaging ingredients, specifically stating that PFAS and bisphenol-based chemicals "may not be intentionally introduced into packaging materials."[479]

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[474] Press Release, U.S. Envtl. Prot. Agency, EPA Proposes Updates to Strengthen the Safer Choice Standard (Nov. 13, 2023) (available at https://www.epa.gov/newsreleases/epa-proposes-updates-strengthen-safer-choice-standard).

[475] *Frequently Asked Questions on Safer Choice*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/saferchoice/frequently-asked-questions-safer-choice#pane-6 (last visited Mar. 14, 2024).

[476] 42 U.S.C. § 13103(b)(5); 42 U.S.C. § 4332(2)(g); 88 Fed. Reg. 78,017 (Nov. 14, 2023); U.S. ENVTL. PROT. AGENCY, EPA'S SAFER CHOICE STANDARD NOVEMBER 2023, EPA-HQ-OPPT-2023-0520-0003 (Nov. 14, 2023).

[477] *See* 88 Fed. Reg. 78,017 (Nov. 14, 2023) (EPA's Safer Choice and Design for the Environment (DfE) Standard, 2023 Revisions).

[478] *Id*.

[479] *Id*.

EPA's existing Safer Choice Program and proposed revisions to the Safer Choice standards have the potential to help drive the innovation of design and materials. By requiring a certain percentage of recycled content for certified Safer Choice products, EPA can incentivize product manufacturing and design that relies less on primary plastic feedstock. Additionally, and as evidenced by the proposed changes to primary packaging ingredients, EPA can improve standards for the labeling of recyclable products.

How the Safer Choice Program may be applied to Intervention 2, innovation of material and product design through standards for labeling and marketing:
As evidenced by the proposed changes to the Safer Choice Program's section governing "primary packaging ingredients," EPA's Safer Choice Program can spur innovation of material and product design through the adoption of more ambitious labeling standards for sustainable products.

b. Pollution Prevention Grant Program

The P2 Act's grantmaking authority is primarily implemented through the EPA's Pollution Prevention Grant Program. The EPA uses these grants to fund technical assistance programs that "help businesses reduce the use of release of hazardous materials, the use of water, energy and other raw materials, while also lowering business costs."[480] The P2 Act requires the EPA to award these federal grants to states, state entities (including colleges and universities), territories, and federally recognized tribes.[481] The Pollution Prevention Grant Program issued 504 grants for $54.1 million between 2011 and 2021.[482] The EPA estimates these grants resulted in a reduction of 917 million pounds of hazardous materials released into the environment.[483] Some of these grants target plastics specifically. For example, an FY2022-2023 grant to the Vermont Department of Environmental Conservation will fund the state's work with local food processors to evaluate plastic packaging and reduce PFAS.[484] The same year the EPA partnered with the University of Hawai'I Sea Grant Program to invest $2.1 million into a city-wide reusable foodware system in Hilo, Hawaii.[485] In

[480] *Pollution Prevention Grants Overview,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/p2/pollution-prevention-grants-overview (last visited Mar. 14, 2024).
[481] *Id*.
[482] *Id*.
[483] *Id*.
[484] U.S. ENVTL. PROT. AGENCY, FY2022-FY2023 BIPARTISAN INFRASTRUCTURE LAW POLLUTION PREVENTION GRANT SUMMARIES (2023), https://www.epa.gov/system/files/documents/2022-11/P2_Grant_Summaries_BIL.pdf (last visited Mar. 14, 2024).
[485] News Release, U.S. Envtl. Prot. Agency, Biden-Harris Administration Makes Over $2.1 Million Grant Investments in Innovative Reuse and Refill Program in Hilo, Hawaii (Oct. 13, 2024) (available at https://www.epa.gov/newsreleases/biden-harris-administration-makes-over-21-million-grant-investments-innovative-reuse).

the FY2023-2024 cycle, the EPA has awarded four grants to facilitate technical assistance for businesses in the food service industry to reduce the use of plastic products.[486]

i. Advancing Environmental Justice

The Bipartisan Infrastructure Law provided the Pollution Prevention Grant Program with $100 million from FY2022 to FY2026.[487] The EPA will use the Pollution Prevention Grant Program to advance the "Justice40 Initiative, which aims to deliver more than 40 percent of the overall benefits of certain federal investments to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution."[488] In October of 2023, EPA announced the selection of award recipients for two grant programs—authorized under the Pollution Prevention Grant Program—that "will enable states to provide businesses with technical assistance to help develop and adopt pollution prevention practices that advance environmental justice in underserved communities."[489] These programs are: (1) Environmental Justice in Communities grant program; and (2) Environmental Justice Through Safer and More Sustainable Products grant program.

One recipient under the Environmental Justice in Communities grant program, the U.S. Virgin Islands Department of Planning and Natural Resources, received funding for a project that will provide "technical assistance to VI businesses in the food service industry by expanding on the existing VI Clean Coasts program, which focuses on significantly reducing the use and disposal of single-use plastics, polystyrene foam, and other pollution."[490] This project aims to "reduce exposure to harmful chemicals, pollution, and waste in historically marginalized, underserved, and overburdened VI communities."[491] Both the University of Illinois and Clemson University also received funding under the Environmental Justice Through Safer and More Sustainable Products grant program for projects that seek to reduce the amount of plastic waste in the environment, with a specific focus on disadvantaged areas.[492]

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[486] *Summaries of the FY 23–24 P2 EJ Grant Selections,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/system/files/documents/2023-10/summaries-of-the-fy-23-24-p2-ej-grant-selections_0.pdf (last visited Mar. 14, 2024).

[487] Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021).

[488] Press Release, U.S. ENVTL. PROT. AGENCY, Biden-Harris Administration Selects 24 Recipients to Receive Nearly $16 Million in Pollution Prevention Grants to Advance Environmental Justice (Oct. 12, 2023) (available at https://www.epa.gov/newsreleases/biden-harris-administration-selects-24-recipients-receive-nearly-16-million-pollution).

[489] *Pollution Prevention Grants Overview*, *supra* note 480.

[490] *See* U.S. ENVTL. PROT. AGENCY, SUMMARIES OF THE FY 23-24 P2 EJ GRANT SELECTIONS (2023), https://www.epa.gov/system/files/documents/2023-10/summaries-of-the-fy-23-24-p2-ej-grant-selections_1.pdf (the EPA awarded grants to the U.S. Virgin Islands Department of Planning and Natural Resources, Clemson University, the University of Illinois Chicago, and the University of Hawai'i for decreasing plastic waste in food processing and packaging).

[491] *Id*.

[492] *Id*.

How the Pollution Prevention Grant Program may be applied to Intervention 2, innovation of material and product design through voluntary commitments and collaborations:

The EPA's Pollution Prevention Grant Program, authorized by the Pollution Prevention Act of 1990, funds technical assistance projects to help businesses reduce the use hazardous materials. Past grants have funded projects aimed at reducing the use of plastic products, including those that contain PFAS, in food packaging and processing.

c. Potential P2 Act Expansion

While the P2 Act does not authorize the EPA to take regulatory actions, the scope of the law's facilitative authorities is broad. In addition to P2 Act's grantmaking authorities, the law empowers the EPA to take actions including:

(1) "establish standard methods of measurement of source reduction,"[493]
(2) coordinate source reduction efforts across the federal government,[494]
(3) "facilitate the adoption of source reduction techniques by businesses,"[495]
(4) "identify and make recommendations to Congress to eliminate barriers to source reduction including the use of incentives and disincentives," and
(5) "establish a Source Reduction Clearinghouse to compile information including a computer data base which contains information on management, technical, and operational approaches to source reduction."[496]

The EPA could expand its efforts under these statutory authorities to support source reduction of plastic pollution specifically. For example, the EPA could use its Source Reduction Clearinghouse to publish information about the use of pollution prevention policies like deposit return systems and extended producer responsibility systems. The EPA could also consider ways to expand its P2 Act programs to cover microplastics specifically. Microplastics could conceivably fall under the P2 Act's purview as they could be regulated as pollutants and contaminants under the Clean Water Act (as a suspended solid) and the Clean Air Act (as $PM_{2.5}$).[497] The EPA could consider establishing methods of measuring and monitoring microplastics as a unique pollutant and otherwise encourage microplastic reduction under all its existing P2 Act grants and programs.[498]

How the Pollution Prevention Act may be applied to Intervention 3, decreasing waste management through deposit return and reuse and refill systems:

[493] 42 U.S.C. § 13103(b)(1).
[494] 42 U.S.C. § 13103(b)(3).
[495] 42 U.S.C. § 13103(b)(5).
[496] 42 U.S.C. § 13105(a)(3).
[497] Mary Ellen Ternes et al. Plastics Pollution Comment, *supra* note 140, at 32–33.
[498] *Id*.

Through the P2 Act's authorization to develop strategies to promote the wider adoption of source reduction strategies, gather and share information on source reduction techniques, and otherwise contribute to state and local capacity building efforts for pollution prevention, the EPA could issue guidance and technical assistance on the development of policies such as deposit return systems.

How the Pollution Prevention Act may be applied to Intervention 3, decrease waste generation through extended producer responsibility requirements (end-of -life management):

Through the P2 Act's authorization to develop strategies to promote the wider adoption of source reduction strategies, gather and share information on source reduction techniques, and otherwise contribute to state and local capacity building efforts for pollution prevention, the EPA could issue guidance and technical assistance on the development of policies such as extended producer responsibility requirements.

How the Pollution Prevention Act supports the interventions through information and data collection, education and outreach, and research and development activities:

The P2 Act authorizes the EPA to engage in a broad range of capacity building efforts to improve state and local source reduction initiatives. These include the authority to compile and share information with state and local partners on various approaches to source reduction through the Source Reduction Clearinghouse,[499] to mount outreach and education efforts to further the adoption of source reduction technologies,[500] and to identify opportunities for further research and development into source reduction technologies.[501]

11. Save Our Seas Act of 2018 and Save Our Seas 2.0 Act of 2020
(Environmental Protection Agency; National Oceanic and Atmospheric Administration)

The original Save Our Seas Act of 2018 was a modest bill that reauthorized the Marine Debris Program (discussed in the National Oceanic and Atmospheric Administration section below)[502] and directed NOAA to assist in the response to severe marine debris events.

The Save Our Seas 2.0 Act of 2020 was more significant legislation that increased the federal government's role in mitigating plastic pollution. The law expanded NOAA's grantmaking for plastics mitigation. The law created the Marine Debris Foundation—a publicly funded foundation that works in consultation with NOAA to make similar investments in plastics pollution reduction and prevention.[503] The law also explicitly directed NOAA to prioritize marine debris efforts in all other

[499] 42 U.S.C. § 13105(a).
[500] 42 U.S.C. § 13105(a)(2).
[501] 42 U.S.C. § 13107(b).
[502] See *infra* ELI Report, at Section IV(C)(1)(b).
[503] 33 U.S.C. § 4211; 33 U.S.C. § 1959.

existing innovation and entrepreneurship grant programs.[504] Under this Act, NOAA was directed to submit to Congress a report containing: "1) an analysis of the scale of lost fishing gear by losses by domestic and foreign fisheries . . . 2) an evaluation of the ecological, human health, and maritime safety impacts of derelict fishing gear, and how those impacts vary across [types and materials used for fishing gear and geographic location; and 3) recommendations on management measures."[505] As of the date of this report, NOAA has not yet submitted this report required under the Save Our Seas 2.0 Act.

The Save Our Seas 2.0 Act also amended the Marine Debris Act in other ways that increase its relevance to the NASEM Report intervention areas such as decreasing plastic waste generation, facilitating innovative material and product designs, and improving waste management. For example, the amended law directs NOAA to prioritize projects advancing the "circular economy" in its grantmaking,[506] establish a Genius Prize for Save Our Seas Innovations (discussed below),[507] and conduct more research into microfibers, microplastics, fishing gear, circular polymers (by the National Institute of Standards and Technology), and plastic pollution generally (by EPA).[508] Further, section 132 of the Save Our Seas 2.0 Act directed the Interagency Marine Debris Coordinating Committee, a multi-agency body responsible for interagency marine debris research,[509] to submit a report to Congress on microfiber pollution. To date, a Draft Report has been published that defined "microfiber," examined sources of microfiber pollution, proffered a recommendation for a standardized methodology to measure microfiber pollution and plan for how federal agencies can lead opportunities on the reduction of microfiber pollution.[510]

a. Genius Prize Award
(National Oceanic and Atmospheric Administration)

Under the Save Our Seas 2.0 Act, the Secretary of Commerce is authorized to establish a prize competition—with one or more prizes to be awarded biennially—"to advance human understanding and innovation in removing and preventing plastic waste." Among others, one category of projects eligible for award includes "innovations in production and packaging design that reduce the use of raw materials, increase recycled content, encourage reusability and recyclability, and promote a circular economy."[511]

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[504] 33 U.S.C. § 4211; 33 U.S.C. § 1959.
[505] Save Our Seas 2.0 Act, Pub. L. No. 116-224, Section 135, 134 Stat. 1072 (Dec. 18, 2020).
[506] 33 U.S.C. § 4201.
[507] 33 U.S.C. § 4232.
[508] 33 U.S.C. § 4282.
[509] *See Interagency Marine Debris Coordinating Committee*, NOAA Marine Debris Program, https://marinedebris.noaa.gov/our-work/IMDCC#:~:text=The%20Interagency%20Marine%20Debris%20Coordinating,%2C%20states%2C%20tribes%2C%20and%20other (listing the member agencies of the Committee, including NOAA, EPA, USCG, U.S. Navy, U.S. Department of State, DOI, USAID, Mammal Marine Commission, National Science Foundation, NASA, DOJ, and DOE) (last visited Feb. 8, 2024).
[510] U.S. ENVTL. PROT. AGENCY & NOAA MARINE DEBRIS PROGRAM ON BEHALF OF THE INTERAGENCY MARINE DEBRIS COORDINATING COMMITTEE, REPORT ON MICROFIBER POLLUTION, 2022 REPORT TO CONGRESS: DRAFT FOR PUBLIC COMMENT (2022).
[511] Save Our Seas 2.0 Act, Pub. L. No. 116–224, § 122(a)(2)(B), 134 Stat. 1085 (2020).

The authority to grant this award derives from the Stevenson-Wydler Technology Innovation Act of 1980.[512] Under this Act, federal agencies (excluding those of the legislative branch) are permitted to administer prize competition programs "to stimulate innovation that has the potential to advance the mission of the respective agency."[513] Both the Save Our Seas 2.0 Act's "Genius Prize" and the authority granted under the Stevenson-Wydler Technology Innovation Act are existing federal levers that have been and can continue to be employed to spur innovation in the plastics circular economy through public-private partnerships and collaboration.

How the "Genius Prize" applies to Intervention 2, innovate material and product design through voluntary commitments and collaborations:
The Save Our Seas "Genius Prize" is a discrete example of a federal incentive to drive innovation in plastic production and packaging redesign, as well as to advance understanding to remove and prevent plastic waste and pollution.

How the "Genius Prize" supports the interventions through information and data collection and research and development activities:
The Save Our Seas "Genius Prize" generally funds research and development projects, which may also require information and data collection on various issues or objectives related to plastics.

b. National Recycling Strategy
(Environmental Protection Agency)

The Save Our Seas 2.0 Act also required EPA to "develop a strategy to improve post-consumer materials management and infrastructure for the purpose of reducing plastic waste and other post-consumer materials in waterways and oceans."[514] This directive resulted in EPA's ongoing efforts to produce a comprehensive National Recycling Strategy. Rather than one plan, EPA has been working toward this goal by releasing a series of documents all designed to work toward the development of a circular economy. The National Recycling Strategy focuses on identifying challenges facing the recycling system an offering data, tools and other resources for states and local governments to overcome those challenges.

The Save Our Seas 2.0 Act authorized EPA to spend $55 million per year FY2021-2025 on implementing the National Recycling Strategy through grants to states and private entities.[515] This grant program, known as the Solid Waste Infrastructure for Recycling Program (SWIFR), gives the National Recycling Strategy more practical effect. The Bipartisan Infrastructure Law (the IIJA)

[512] 15 U.S.C. § 3719.
[513] 15 U.S.C. § 3719.
[514] 33 U.S.C. § 4281.
[515] Allyn L. Stern & Deepti B. Gage, *Bipartisan Save Our Seas 2.0 Act Signed into Law*, NAT'L L. REV. (Dec. 23, 2020).

funded the SWIFR program,[516] which issued its first grants on September 13, 2023.[517] SWIFR grants primarily fund the recycling programs of state and local governments, allowing them to make infrastructure improvements, hire employees, and launch new initiatives consistent with the goals and policy recommendations of the National Recycling Strategy.

EPA released the first iteration of the National Recycling Strategy in November 2019. This document, the "National Framework for Advancing the U.S. Recycling System," (the Framework) identified four main challenges the U.S. recycling system must address to be effective: (1) promoting education and outreach; (2) enhancing infrastructure; (3) strengthening materials markets; and (4) enhancing measurement. The National Framework also identified specific voluntary actions, ongoing and planned, that EPA and recycling stakeholders could take to improve the effectiveness and resiliency of America's recycling system. An example of these actions included EPA's development and issuance of a secondary materials market toolkit for governments, materials recovery facilities, and secondary processing facilities.[518] This toolkit, discussed further below, has since been incorporated into EPA's broader Model Recycling Program Toolkit, which was released in November of 2023.[519]

Next, after incorporating public comments and private stakeholder feedback from the Framework, EPA released its first draft "National Recycling Strategy" in October 2020.[520] This document "builds on the 2019 National Framework for Advancing the U.S. Recycling System and EPA's long history of providing data, tools, information, and other resources to support recycling in the United States."[521] Around the same time, in November 2020, the EPA announced a National Recycling Goal of increasing the national recycling rate to 50 percent by 2030.[522] While the National Recycling Goal has no legal effect, it includes additional metrics for the EPA to use to track progress toward the national goal. These metrics provide a useful way to monitor EPA's efforts in advancing national recycling. The official metrics are:

(1) reductions in contamination of recycling (as calculated by the percentage of contaminants in recycled materials),
(2) efficiency in the recycling processing system (as measured by the percentage of materials successfully recycled through a recycling facility compared to the materials it receives), and

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[516] Solid Waste Infrastructure for Recycling Program: Request for Information, 87 Fed. Reg. 35,200 (June 9, 2022).
[517] *Recycling Grant Selectees and Recipients,* U.S. ENVTL. PROT. AGENCY (2023), https://www.epa.gov/infrastructure/recycling-grant-selectees-and-recipients.
[518] U.S. ENVTL. PROT. AGENCY, NATIONAL FRAMEWORK FOR ADVANCING THE U.S. RECYCLING SYSTEM 4 (Nov. 2019), https://www.epa.gov/sites/default/files/2019-11/documents/national_framework.pdf.
[519] *Model Recycling Program Toolkit*, U.S. ENVTL. PROT. AGENCY, https://cfpub.epa.gov/wizards/recyclingtoolkit/ (last visited Mar. 14, 2024).
[520] U.S. ENVTL. PROT. AGENCY, NATIONAL RECYCLING STRATEGY (Oct. 5, 2020), https://www.epa.gov/sites/default/files/2020-10/documents/draft_national_recycling_strategy.pdf.
[521] U.S. ENVTL. PROT. AGENCY, DRAFT NATIONAL RECYCLING STRATEGY EXECUTIVE SUMMARY (2020), https://www.epa.gov/sites/default/files/2020-12/documents/final_strategy_to_print_508.pdf.
[522] U.S. ENVTL. PROT. AGENCY, THE NEW NATIONAL RECYCLING GOAL (2020), https://www.epa.gov/sites/default/files/2020-12/documents/final_one_pager_to_print_508.pdf.

(3) strengthening the economic markets for recycled material (as measured by the average market price of a ton of recycled materials).[523]

In November 2021, after incorporating public comments and private stakeholder feedback from the draft, the EPA published the first part of a finalized National Recycling Strategy in a document called "National Recycling Strategy: Part One of a Series on Building a Circular Economy for All."[524] This strategy document "is aligned and supports the National Recycling Goal of a 50 percent recycling rate by 2030."[525] The document details five strategic objectives. They are:

(1) Improving Markets for Recycling Commodities – promoting secondary materials markets, increasing manufacturing use of recycled material feedstocks in domestic manufacturing, increasing demand for recycled materials through public policy, and more.
(2) Increasing Collection and Improving Materials Management Infrastructure – investing in collection and optimization efforts, increasing awareness of existing funding for recycling programs, and investing in new technologies and processes for recycling,
(3) Reducing Contamination in the Recycled Materials Stream – enhancing education and outreach to the public on how to avoid contaminating the recycled materials stream.
(4) Enhancing Policies and Programs to Support Circularity – sharing best practices on policies, programs, funding opportunities and outreach through an online clearinghouse, conducting analyses of different policies to address recycling challenges, and more.
(5) Standardizing Measurement and Increasing Data Collection – developing consistent methodologies to measure recycling system performance.[526]

The EPA has begun implementing Part One of the National Recycling Strategy in various ways. As mentioned, the SWIFR program provides state and local grants to fund projects that advance the objectives of the National Recycling Strategy.[527] The EPA also keeps a "Circular Economy Implementation Plan Online Platform," an online resource that contains the most up-to-date information on the National Recycling Strategy and the implementation status of each of its objectives (although, as of March 2024, every objective is marked as "Not Started").[528] However, the EPA has published a "Model Recycling Program Toolkit," an online resource to "help states, territories, local governments, tribes, schools, nonprofit organizations, companies, and public-

[523] *Id*.
[524] U.S. ENVTL. PROT. AGENCY, NATIONAL RECYCLING STRATEGY: PART ONE OF A SERIES ON BUILDING A CIRCULAR ECONOMY FOR ALL (Nov. 15, 2021), https://www.epa.gov/system/files/documents/2021-11/final-national-recycling-strategy.pdf.
[525] *Id*.
[526] U.S. ENVTL. PROT. AGENCY, EXECUTIVE SUMMARY, NATIONAL RECYCLING STRATEGY: PART ONE OF A SERIES ON BUILDING A CIRCULAR ECONOMY FOR ALL (2021), https://www.epa.gov/system/files/documents/2021-11/national-recycling-strategy-executive-summary.pdf.
[527] *Solid Waste Infrastructure for Recycling Grant Program,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/infrastructure/solid-waste-infrastructure-recycling-grant-program (last visited Mar. 14, 2024).
[528] *Circular Economy Implementation Plan Online Platform,* U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/circulareconomy/circular-economy-implementation-plan-online-platform (last visited Mar. 14, 2024).

private partnerships create effective programs for recycling."[529] The toolkit includes best practices, case studies, training materials, consumer education materials, grantee evaluation guides, sample contracts with haulers or collectors, and more.[530]

How EPA's National Recycling Strategy may be applied to Intervention 4, capturing waste through disposal, collection, and recycling improvements:
As directed by the Save Our Seas 2.0 Act, the EPA has developed a National Recycling Strategy. The strategy primarily focuses on building the capacity of states and local communities to improve recycling systems. For example, through the National Recycling Strategy's Model Recycling Program Toolkit, the EPA publishes a wide variety of best practices, training materials, and model contracts, for states, local governments, and private waste managers to use. The EPA's Solid Waste Infrastructure for Recycling Program (SWIFR) also funds state and local projects that advance the National Recycling Strategy. The program issues $55 million in grants annually to improve post-consumer materials management and infrastructure; support improvements to local post-consumer materials management and recycling programs; and assist local waste management authorities in making improvements to local waste management systems.[531]

How EPA's National Recycling Strategy may support the interventions through research and development activities:
The National Recycling Strategy includes a national goal (dubbed the "National Recycling Goal") of achieving a 50 percent recycling rate by 2030. While the National Recycling Goal has no legal effect, it includes additional metrics for the EPA to use to track progress toward the national goal.

c. Draft National Strategy to Prevent Plastic Pollution
(Environmental Protection Agency)

In 2023, in response to Congressional direction, as well as part of the agency's "Series on Building a Circular Economy for All" and as an extension its National Recycling Strategy, the EPA issued a "Draft National Strategy to Prevent Plastic Pollution" (Draft Strategy) in 2023. EPA developed the Draft Strategy pursuant to the authority and obligation conferred by section 301 of the Save Our Seas 2.0 Act, which directed the agency to "develop a strategy to improve post-consumer materials management and infrastructure to reduce plastic waste and other post-consumer materials in waterways and oceans."[532]

The Draft Strategy was the agency's first effort at an EPA-wide approach to addressing plastic pollution and drew heavily from the NASEM report and approach. It "identifies how EPA can work collaboratively with stakeholders to prevent plastic pollution and reduce, reuse, recycle, collect, and

[529] *Model Recycling Program Toolkit*, U.S. ENVTL. PROT. AGENCY, https://cfpub.epa.gov/wizards/recyclingtoolkit/ (last visited Mar. 14, 2024).
[530] *Id*.
[531] *Solid Waste Infrastructure for Recycling Grant Program*, *supra* note 527.
[532] EPA DRAFT NATIONAL STRATEGY TO PREVENT PLASTIC POLLUTION, *supra* note 28, at 13.

capture plastic and other waste from land-based sources."[533] The Draft Strategy is organized around three primary objectives with corresponding, proposed actions. The objectives are to: (1) reduce pollution during plastic production; (2) improve post-use materials management; and (3) prevent trash and microplastics and nanoplastics from entering waterways and remove escaped trash from the environment.[534] Specifically, the Draft Strategy includes the following relevant sub-strategies:

> A1. Reduce the production and consumption of single-use, unrecyclable, or frequently littered plastic products;
> A2. Minimize pollution across the life cycle of plastic products;
> B1. Conduct a study of the effectiveness of existing public policies and incentives upon the reuse, collection, recycling, and conservation of materials;
> B2. Develop or expand capacity to maximize the reuse of materials;
> C1. Identify and implement policies, programs, technical assistance, and compliance assurance actions that effectively prevent trash, microplastics, and nanoplastics from getting into waterways or remove such waste from waterways once it is there;
> C2. Improve water management to increase trash and microplastic and nanoplastic capture in waterways and stormwater/wastewater systems.[535]

One example is the proposed action to "develop or expand capacity to maximize the reuse of materials" under the objective to "improve post-use materials management." The NASEM Report interventions areas examined throughout this report largely, but incompletely, overlap with the Draft Strategy's objectives and proposed actions.

The Draft Strategy does not create any enforceable rights or legally binding requirements. As of the date of this report, EPA is currently reviewing the public comments it received for the Draft Strategy, and it is to be determined what enforceable rights or legally binding requirements will emerge from a final strategy. The Draft Strategy may potentially apply to interventions 1 (reduce plastic production and pollution from production), 2 (innovate of material and product design), 4 (improve waste management), and 5 (capture waste), among others.

12. Environmental Research, Development, and Demonstration Authorization Act of 1978

Through the Environmental Research, Development, and Demonstration Authorization Act of 1978, Congress created overarching research mandates for the EPA's Office of Research and Development (ORD).[536] ORD, the "scientific research arm of EPA," develops and supports research that is structured around "six highly integrated and transdisciplinary national research programs that are

[533] *Id*. at 1.
[534] *Id*. at 1–2.
[535] *Id*.
[536] *See, e.g.*, Environmental Research, Development, and Demonstration Authorization Act of 1978, Pub. L. No. 95–477, 92 Stat. 1507 (1978) (directing the Administrator to continue conducting full scale demonstrations of energy-related pollution control strategies to fulfill provisions of the CWA and other pertinent federal pollution control statutes).

closely aligned with the Agency's strategic goals and cross-Agency strategies."[537] One of these six research programs, the Safe and Sustainable Water Resources (SSWR) program, "provides robust research and scientific analyses to innovatively and economically support safe and adequate supplies of water—protecting people's health and livelihood while restoring and maintaining watershed and aquatic ecosystems."[538]

The SSWR works across a variety of disciplines and the program's research activities are authorized, required, or otherwise encouraged by several statutes, such as the CWA, SDWA, RCRA, and CERCLA.[539] Particularly relevant to this report is SSWR's ongoing work related to the study of microplastics in water resources. SSWR has identified a need to standardize the collection and assessment of microplastics across a variety of media.[540] One of the enumerated "Outputs" of SSWR's Advanced Ambient Water Quality Research is

> to develop or adapt methods to evaluate the human health and aquatic life effects of microplastics, particularly the smaller size range of particles less than 1,000 nm, often referred to as nanoplastics. Research will focus on 1) developing applications of in vitro and computational toxicology approaches to assess health impacts from exposure to microplastics in experimental models and 2) developing methods, models, and tools to evaluate cellular uptake and clearance of microplastics using cell cultures. Research on aquatic resources will focus on 1) determining the potential toxicological impacts of bio-based plastics on aquatic life and 2) evaluating the cumulative effects on coral growth from exposure to environmentally relevant microplastic concentrations and elevated temperatures. This research will fill key data gaps necessary for EPA program offices and regions, states, and Tribes to assess microplastic effects and inform possible regulations.[541]

The SSWR's ongoing research that seeks to address the environmental health effects of microplastics is a discrete example of a lever EPA—through the general research mandates of ORD—has to drive data collection and information sharing for the purpose of addressing plastic pollution. More generally, EPA's research that seeks to "determine appropriate analytical methods to characterize and quantity total microplastics in sediment and water samples, as well as different types of plastic

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[537] *About Our Research*, OFF. OF RESEARCH & DEV., U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/research/about-our-research#:~:text=The%20Office%20of%20Research%20and,%2C%20tribal%2C%20and%20community%20partners (last visited Mar. 14, 2024).

[538] OFF. OF RESEARCH & DEV., U.S. ENVTL. PROT. AGENCY, SAFE AND SUSTAINABLE WATER RESOURCES: STRATEGIC RESEARCH ACTION PLAN, FISCAL YEARS 2023–2026 vii (Oct. 2022).

[539] *Id*. at 3 (noting the CWA objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters;" EPA's directives under the SDWA to set national health-based standards for drinking water and establish other regulatory programs, such as the Underground Injection Control programs; and general references to CERCLA and RCRA's provisions addressing groundwater protection and improvement).

[540] *Id*. at 20.

[541] *Id*. at 25.

polymers," can help inform recommendations for best practices to "characterize and assess the extent of micro and nanoplastics pollution in water."[542]

How the Environmental Research, Development, and Demonstration Authorization Act may support the interventions through research and development activities:
Using its general research mandates under the Environmental Research, Development, and Demonstration Authorization Act of 1978, as well as other federal pollution control statutes, EPA can continue to conduct research that seeks to standardize methods for microplastic collection, extraction, and identification in surface water and sediments through programs housed under and funded through the Office of Research and Development.

13. Small Business Development Act of 1982

Through the Small Business Development Act of 1982, Congress authorized the Small Business Innovation Research (SBIR) Program.[543] The goal of the SBIR Program is to "provide federal research and development funding to stimulate the small business sector and to address national needs while strengthening the national base for technological innovation."[544] All federal agencies with an "extramural budget for [research/research and development] in excess of $100,000,000 must participate in the SBIR program and obligate, at a minimum, 3.2% of such budget" for SBIR awards.[545]

The EPA is one of the 11 federal agencies that participate in the SBIR Program and "issues an annual solicitation for proposals from U.S. small businesses to develop and commercialize innovative technologies that address [EPA's] mission."[546] Through its SBIR Program, EPA has solicited proposals that seek to address microplastic pollution. For example, in 2022, EPA requested proposals for the development of technologies "to better characterize environmental samples of microplastics (5mm—1 nm or any defined subset) in environmental matrices such as water, wastewater or soil."[547]

How the Small Business Development Act may support the interventions through research and development activities:

[542] *Microplastics Research*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/water-research/microplastics-research (last visited Mar. 14, 2024).
[543] Small Business Innovation Development Act of 1982, Pub. L. No. 97–219, 96 Stat. 217 (1982).
[544] *Small Business Innovation Research Program (SBIR) Legislation, Regulation, and Guidance*, U.S. DEP'T OF EDUC., https://www2.ed.gov/programs/sbir/legislation.html (last visited Mar. 14, 2024); 15 U.S.C. § 638.
[545] OFF. OF INVESTMENT & INNOVATION, U.S. SMALL BUS. ADMIN., SMALL BUSINESS INNOVATION RESEARCH (SBIR) AND SMALL BUSINESS TECHNOLOGY TRANSFER (STTR) PROGRAM, POLICY DIRECTIVE 2(B) (Oct. 2020).
[546] *Small Business Innovation Research (SBIR) Program*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/sbir (last visited Mar. 14, 2024).
[547] *Technologies to process, sort and identify microplastics*, U.S. SMALL BUS. ASS'N, https://www.sbir.gov/node/2228851 (last visited Mar. 14, 2024).

EPA can continue to fund research and demonstrations of technologies that seek to address plastic pollution—specifically the collection, quantification, and characterization of microplastics—through its SBIR Program awards.

C. Department of Commerce

1. National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) is the federal agency housed in the Department of Commerce with regulatory authority over environmental and conservation issues in oceans and coastal waters. Therefore, NOAA is the primary federal agency with authority to act on marine plastic pollution.

The following authorities to reduce plastic pollution fall under statutes primarily administered by NOAA, although many specific programs are jointly administered between NOAA and the EPA.

a. Coastal Zone Management Act

The Coastal Zone Management Act (CZMA), passed in response to the 1969 Santa Barbara oil spill, creates a national framework to encourage states to protect their coastal resources. The law relies on incentivizing states to enroll in the National Coastal Zone Management Program (NCZMP), a voluntary partnership between the federal government and states to advance coastal protection.[548] Enrollment requires states to establish Coastal Zone Management Programs (CMPs)—federally-approved, state-operated programs that "must contain a broad class of policies for each of the following areas: coastal resource protection, management of coastal development, and simplification of governmental processes."[549] If a state develops a CMP that adheres to the CZMA and its implementing regulations, then the state becomes eligible for several federal grants to aid its coastal management. With an approved CMP, a state also earns the opportunity to review federal agency actions with reasonably foreseeable effects on a state's coastal zone resources for consistency with the enforceable policies of a state's CMP. [109] This process is known as a federal consistency determination review, and it can apply to federal agency actions such as federal licensing, permitting, and financial assistance.[550]

The most relevant aspects of the law for mitigating plastic pollution are: 1) the authority the CZMA gives the federal government to determine what states consider in their CMPs; and 2) the CZMA-authorized grant programs.

i. Coastal Zone Management Programs

[548] EVA LIPIEC, CONG. RESEARCH SERV., R45460, COASTAL ZONE MANAGEMENT ACT (CZMA): OVERVIEW AND ISSUES FOR CONGRESS 1 (Jan. 15, 2019).
[549] 15 C.F.R. § 923.2(c).
[550] CONG. RESEARCH SERV., R45460, *supra* note 548, at 24.

Federal regulations implementing the CZMA establish the requirements for a valid CMP. Under these regulations, a state's CMP must:

(1) "Identif[y] and evaluate . . . those coastal resources recognized in the Act as requiring management or protection by the State."[551]
(2) "Reexamine[] . . . existing policies or develop[] new policies to manage [coastal] resources."[552] These policies must be specifically articulated and designed to protect coastal wetlands, natural floodplains, and otherwise minimize the impact of flooding.[553] And lastly,
(3) "Contain[] . . . enforceable policies and mechanisms to implement the applicable requirements of the Coastal Nonpoint Pollution Control Program of the state required by section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990."[554]

The Coastal Nonpoint Pollution Control Program (CNPCP), therefore, is the one CZMA program that a state's CMP must specifically address.[555] Participation in other CZMA authorized programs such as the Coastal Resource Improvement Program and the Coastal and Estuarine Land Conservation Program may help win approval for a CMP, but they are not technically required.

The CNPCP, which is jointly run by EPA and NOAA, is also the most relevant CZMA program for mitigating plastic pollution.[556] The CZMA established the CNPCP "to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters, working in close conjunction with other State and local authorities."[557] These "management measures" refer to general practices and strategies endorsed by the federal government to reduce nonpoint source pollution.[558] The CZMA instructs the EPA and NOAA to issue guidelines detailing management measures states can use to control runoff from five main sources: agriculture, forestry, urban areas, marinas, and hydromodification (shoreline and stream channel modification).[559] In their CMPs, states must then "provide for the implementation, at a minimum, of management measures in conformity with the guidance" published by EPA and NOAA.[560] States must also continually revise their approach to implementing the management measures so as to maintain applicable water quality standards under the CWA.[561]

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[551] 15 C.F.R. § 923.1(c)(1).
[552] 15 C.F.R. § 923.1(c)(2).
[553] 15 C.F.R. § 923.3(b)–(c).
[554] 15 C.F.R. § 923.1(c)(9).
[555] CONG. RESEARCH SERV., R45460, supra note 548, at 3 ("The majority of CZMA provisions are voluntary, with the notable exception of Section 6217, the Coastal Zone Reauthorization Amendments Act (§6127 of P.L. 101-508), which added a mandatory component to CZMA: the National Coastal Nonpoint Pollution Control program, which requires coastal states with approved coastal management programs to reduce polluted runoff to coastal waters through specific land-based measures").
[556] Because plastic waste enters the environment from several sources (litter, sewage, stormwater) it is considered a nonpoint source of pollution.
[557] 16 U.S.C. § 1455b(a)(1).
[558] 16 U.S.C. § 1455b(g)(5).
[559] 16 U.S.C. § 1455b(g).
[560] 16 U.S.C. § 1455b(b).
[561] 16 U.S.C. § 1455b(b)(3).

The management measures for nonpoint source pollution in coastal urban areas can directly or indirectly target plastic pollution.[562] For example, EPA's management measures for urban areas include identifying and managing urban runoff, enacting watershed protection policies, limiting the increase of impervious areas, regulating construction activities, regulating runoff from existing development, appropriately siting onsite disposal systems, roads, and bridges, and enacting general pollution prevention policies.[563]

The current guidance for management measures does not extensively address plastic pollution. However, under the general pollution prevention management measure, the guidance does suggest controlling litter through the "develop[ment of] local ordinances restricting or prohibiting food establishments from using disposable food packaging, especially plastics, styrofoams, and other floatables."[564]

The CZMA explicitly gives NOAA and the EPA power to periodically revise the guidelines for compliance with the CNPCP,[565] and none of the program's guidance documents appear to have been updated since 1993.[566] Therefore, one way to leverage the CZMA in a new plastics regulatory scheme would be to issue new or updated guidance on the prevention of nonpoint source plastic pollution. For example, the guidance could call for more robust pollution prevention programs for plastics, such as disposal, collection, and recycling improvements.

How the CZMA may be applied to Intervention 4, improve waste management through ocean/river discharge limits:
The CZMA incentivizes states to adopt coastal management plans to manage coastal resources and limit nonpoint source pollution through prevention programs. This includes nonpoint source plastic pollution from sources like stormwater runoff and litter. NOAA and the EPA could update the guidelines for the Coastal Nonpoint Pollution Control Program to mandate states participating in the National Coastal Zone Management Program explicitly address nonpoint source plastic pollution in their CMP. States can also voluntarily enhance their coastal nonpoint pollution control programs to specifically address plastic pollution in runoff from urban areas, stormwater systems, etc.

ii. CZMA Grantmaking

[562] U.S. ENVTL. PROT. AGENCY, GUIDANCE SPECIFYING MANAGEMENT MEASURES FOR SOURCES OF NONPOINT POLLUTION IN COASTAL WATERS Ch. 4, 134 (1993) (available at https://www.epa.gov/nps/guidance-specifying-management-measures-sources-nonpoint-pollution-coastal-waters).
[563] *Id*.
[564] *Id*.
[565] 16 U.S.C. § 1455b(g)(1).
[566] GUIDANCE SPECIFYING MANAGEMENT MEASURES FOR SOURCES OF NONPOINT POLLUTION IN COASTAL WATERS, *supra* note 562.

Coastal states with approved CMPs are eligible to apply for federal grants related to coastal zone management.[567] These grants include the following:

- Section 306 Administrative Grants: These grants aid in the administration of a state's CMP. The amount of these grants is determined by considering "the extent and nature of the shoreline and area covered by the program, population of the area, and other relevant factors."[568]
- Coastal Resource Improvement Program: A grant program to assist states with the preservation of coastal areas, the redevelopment of urban waterfronts and ports, creating access to public beach and coastal areas, and the development of aquaculture facilities in coastal zones.[569]
- Coastal and Estuarine Land Conservation Program: A grant program to facilitate land buybacks that will further the goals of the state CMP or other regional state watershed protection plans.[570]
- Coastal Zone Enhancement Grants: A grant program for a wide array of coastal zone enhancement objectives, including 1) protecting coastal wetlands, 2) eliminating or managing development in hazardous areas, 3) increasing public access, 4) reducing marine debris, and more. These grants are distributed through both a weighted formula system and through a separate competitive grant program for "Projects of Special Merit" – innovative and potentially high impact projects.[571]
- Coastal Nonpoint Pollution Control Program: States with an approved CMP that includes a nonpoint source pollution program can apply for these grants to help establish and implement the program.[572]

In FY2022, NOAA distributed about $78 million to states through these grant programs.[573] The majority of this money funds Section 306 Administrative Grants, helping states generally develop and implement their CMPs.[574]

In addition to the CNPCP, the Coastal Zone Enhancement Grants could also be adapted to address plastic pollution. Reducing marine debris is a specifically articulated goal of Coastal Zone Enhancement Grants and there is a specific mechanism ("Projects of Special Merit") to fund innovative projects. Notably, however, since its inception in 2001, none of the funded Projects of Special Merit specifically address plastic pollution.[575] Going forward, NOAA can consider awarding

[567] CONG. RESEARCH SERV., R45460, *supra* note 548, at 6.
[568] 15 U.S.C. § 923.110(a)(4).
[569] 16 U.S.C. § 1455a.
[570] 16 U.S.C. § 1456–1.
[571] 15 C.F.R. § 923.125.
[572] 16 U.S.C. § 1455b(f).
[573] *2022 Funding Summary for NOAA's National Coastal Zone Management Program*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://coast.noaa.gov/data/czm/media/funding-summary.pdf (last visited Mar. 14, 2024).
[574] CONG. RESEARCH SERV., R45460, *supra* note 548, at 6.
[575] NAT'L OCEANIC & ATMOSPHERIC ADMIN., PROJECTS OF SPECIAL MERIT SELECTED FOR FUNDING: FISCAL YEARS 2012 TO 2023 (Oct. 2023), https://coast.noaa.gov/data/czm/enhancement/media/special-merit-funding.pdf.

Projects of Special Merit to projects that address plastic pollution to the extent that the agency receives such proposals.

How the CZMA may be applied to Intervention 4, improve waste management through disposal, collection, and recycling improvements:
The CZMA Grant Programs provides NOAA and the EPA authority to fund projects that may reduce plastic pollution in coastal areas. For example, the Coastal Zone Enhancement Grant Program authorizes funding projects that can reduce marine debris (the majority of which is plastic), and the Nonpoint Pollution Control Program authorizes grants the help states establish programs to limit nonpoint source pollution into coastal waters, including from plastics. NOAA and the EPA could make a more concerted effort to fund plastic pollution reduction projects through this funding authority. For example, since its inception in 2001, none of the funded "Projects of Special Merit" under the Coastal Zone Enhancement Grants have specifically addressed plastic pollution.

b. Marine Debris Act

i. Marine Debris Program

Congress passed the Marine Debris Act (formerly titled "Marine Debris Research, Prevention, and Reduction Act"[576]) in 2006 and amended it once in 2012 and twice more through the Save Our Seas Act of 2018 and Save Our Seas 2.0 Act of 2020. The law directs NOAA to "identify, determine sources of, assess, prevent, reduce, and remove marine debris and address the adverse impacts of marine debris on the economy of the United States, marine environment, and navigation safety."[577] It defines "marine debris" to include "any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes."[578] Plastics are widely considered one of the most pervasive sources of marine debris.

Despite this broad statement of purpose, the Marine Debris Act does not explicitly authorize NOAA to take regulatory action,[579] and NOAA has not issued regulations under the Act other than to clarify the definition of "marine debris."[580] Instead, the law's primary feature is the authorization of NOAA's Marine Debris Program. This program directs NOAA to take nonregulatory actions such as coordinating marine debris prevention and removal efforts across federal agencies, states, and

[576] Marine Debris Act Amendments of 2012, Pub. L. 112-113, § 602(a), 126 Stat. 1567 (2012).
[577] Marine Debris Research, Prevention, and Reduction Act of 2006, Pub. L. No. 109-446, 120 Stat. 3333 (2006).
[578] 33 U.S.C. § 1956.
[579] *Id*.
[580] 33 C.F.R. § 151.3000.

foreign governments. It also authorizes NOAA to issue grants to private entities and local governments for marine debris prevention and removal projects.[581]

The Marine Debris Program's coordination efforts often prompt NOAA's involvement with international bodies devoted to marine debris removal and prevention, making them particularly relevant to efforts to remove plastic waste from the environment (Intervention 5) and minimizing ocean disposal of plastics (Intervention 6). For example, under the Program, NOAA joined the Global Ghost Gear Initiative (the world's leading multi-stakeholder partnership aimed at reducing and preventing the loss of fishing gear into the marine environment) and the Global Partnership on Marine Litter (the leading global coordination effort focused on increasing the understanding of marine debris and promoting coordinated global, regional, and national action to address it).[582]

The Marine Debris Program's grantmaking efforts fund a wide array of projects targeting the reduction and removal of plastic waste (Interventions 3 and 5).[583] However, at just $15 million in authorized appropriations annually for the entire Marine Debris Program, the scale of this grantmaking authority is relatively small.[584]

Marine Debris Program Awards: Funding to Address Plastic Pollution Leakage

Identifying plastic pollution leakage or leakage pathways is a necessary component improving waste management (Intervention 4). As discussed in this report, NOAA's Marine Debris Program—authorized through the Marine Debris Act—vests the NOAA Administrator with authority to administer the program to "identify, determine sources of, assess, prevent, reduce, and remove marine debris."[585] NOAA is required under the Marine Debris Act to "enter into cooperative agreements and contracts and provide financial assistance in the form of grants to accomplish the purposes set forth in [33 U.S.C. § 1951]."[586]

Though the 2012 amendments to the Marine Debris Act removed authorization for NOAA to engage and consult with other relevant federal agencies to undertake "measures to identify the origin, location, and *projected movement* of marine debris within the United States navigable waters, [U.S. Exclusive Economic Zone (EEZ)], and the high seas, including the use of oceanographic, atmospheric, satellite, and remote sensing data," NOAA still retains authority to award grants that "identif[y]" and "determin[e] sources" of marine debris. Taken together, a reasonable interpretation of the "identification and determination of sources of marine debris" suggest that NOAA can provide financial assistance to projects that help to identify the leakage of plastic pollution—a large component of marine debris. Some funded awards specifically for marine debris research for FY2021 touched upon plastic pollution leakage, including the San Diego State University's field,

[581] 33 U.S.C. § 1952.
[582] *International Collaboration*, MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/our-work/international-marine-debris-collaboration (last visited Mar. 14, 2024).
[583] 33 U.S.C. § 1952(d).
[584] 33 U.S.C. § 1958.
[585] 33 U.S.C. § 1952(a).
[586] 33 U.S.C. § 1952(d).

laboratory, and modeling studies to "compare inputs of debris from river margin sources, including encampments and illegal dumping, with debris from storm drain outfalls."[587]

So long as NOAA continues to receive funding to support these awards, the agency can continue identifying opportunities that seek to advance the understanding of plastic pollution leakage pathways in the nation's waters.

Marine Debris Program Research Projects

The Marine Debris Program supports a variety of research projects that address the sources and impacts of marine debris. One project of note is "Determining the Social Costs of Plastic Pollution."[588] Through this project, the Marine Debris Program will support the National Center for Ecological Analysis and Synthesis (NCEAS) as they form a working group on the cost of plastic pollution. The group's "aim is to develop a framework for estimating the dollar value of avoided plastic pollution."[589] The findings of this working group—which will include a range of experts in the fields of economics and the environment—will help local, state, and federal agencies consider the social costs of increasing plastic pollution and the social benefits of reducing plastic pollution.[590]

Citizen Science Initiatives

The Marine Debris Monitoring and Assessment Project (MDMAP) is a "volunteer monitoring program" housed within NOAA's Marine Debris Program that was first established in 2012.[591] Through this program, NOAA has developed and published monitoring protocols to "promote the standardization of shoreline marine debris monitoring efforts."[592] In 2021, NOAA updated MDMAP via the Shoreline Survey Guide, which "provides a written and visual explanation of the NOAA [MDMAP] survey methods, including instruction on creating a survey site, conducting a survey, completing datasheets, and submitting data to NOAA."[593]

How the Marine Debris Program may be applied to Intervention 3, decrease waste generation through reusable and refillable systems:

[587] *The NOAA Marine Debris Program Awards Funding to 5 New Projects to Research Marine Debris*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/funding-opportunities/noaa-marine-debris-program-awards-funding-5-new-projects-research-marine (last visited Mar. 14, 2024).
[588] *Determining the Social Costs of Plastic Pollution,* MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/research/determining-social-costs-plastic-pollution (last visited Mar. 14, 2024).
[589] *Id*.
[590] *Id*.
[591] *Overview of the Marine Debris Monitoring and Assessment Project*, MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/overview-marine-debris-monitoring-and-assessment-project (last visited Mar. 14, 2024).
[592] *Id*.
[593] *NOAA Marine Debris Monitoring and Assessment Project Shoreline Survey Guide*, MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/protocol/noaa-marine-debris-monitoring-and-assessment-project-shoreline-survey-guide (last visited Mar. 14, 2024).

NOAA's Marine Debris Program supports projects across the country preventing marine debris, especially through outreach, education, and funding pilot projects. These projects often support the use of reusable and refillable systems. Examples include funding ReThink Disposable's program to help convert dining operations from single-use food and beverage packaging to reusable food-ware.[594]

How the Marine Debris Program may be applied to Intervention 5, capture waste through removal of plastic wastes from the environment:

NOAA's Marine Debris Program supports locally driven, community-based marine debris removal projects across the country.[595]

How the Marine Debris Program may be applied to Intervention 6, minimize ocean disposal through increased enforcement and reduction of at-sea abandonment or discard of fishing gear:

NOAA's Marine Debris Program supports several international coordination efforts designed to minimize ocean disposal. This includes efforts specifically designed to reduce at-sea abandonment of fishing gear, like the Global Ghost Gear Initiative and the Global Partnership on Marine Litter.[596] Additionally, NOAA should work expeditiously to prepare and submit its congressionally mandated report on the sources and impacts of derelict fishing gear that was due in 2022.

How the Marine Debris Program may support the intervention areas through education and outreach:

NOAA can continue to expand citizen monitoring initiatives, such as the MDMAP, to help "establish a national baseline of trash loading and plastic pollution" over time. Mechanisms like MDMAP (or adaptations of them) demonstrate how NOAA can increase and improve the measurement of trash loadings into waterways to better inform management interventions.[597]

c. Save Our Seas Act of 2018 and Save Our Seas 2.0 Act of 2020

[594] *Stopping Marine Debris at its Source from Coast to Coast*, MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/prevention/stopping-marine-debris-its-source-coast-coast (last visited Mar. 14, 2024).
[595] *Removal,* MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/our-work/removal (last visited Mar. 14, 2024).
[596] *International Collaboration*, MARINE DEBRIS PROGRAM, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/our-work/international-marine-debris-collaboration (last visited Mar. 14, 2024).
[597] Ocean Conservancy Plastic Pollution Comments, *supra* note 66, at 20.

These authorities fall under the purview of NOAA and EPA, and are discussed under the Environmental Protection Agency, Save Our Seas Act of 2018 and Save Our Seas 2.0 Act of 2020 section above.[598]

d. Endangered Species Act
(NOAA Fisheries; U.S. Fish and Wildlife Service)

The Endangered Species Act (ESA)[599] provides for the conservation of plant and animal species that have been listed as threatened or endangered and protects the critical habitat on which listed species depend. The U.S. Fish and Wildlife Service (FWS) and NOAA Fisheries, otherwise known as the National Marine Fisheries Service (NMFS), are responsible for the implementation of the ESA.

Plastic pollution is a major threat to species and their habitat. Animals ingest and become entangled in plastics, and plastic pollution overwhelms and degrades habitat. The ESA may be used to regulate plastics in a variety of ways.

A species may be listed due to the impacts of plastic pollution. The Services consider five factors in determining whether a species is threatened or endangered, and any one of those factors may cause a species to be listed. Plastic pollution may impact at least three of the factors: the present or threatened destruction, modification, or curtailment of [a species'] habitat or range; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting [the species'] survival.[600]

Once a species is listed, it generally receives protections in the form of a recovery plan, potential critical habitat designation and conservation plan, consultation requirements, and protection from activities that may harass, harm (including habitat modification), kill, or otherwise "take" the species.[601] The impacts of plastic pollution on a species and its habitat may be considered under any of these requirements and actions may be taken to minimize those impacts to an extent. For example, research and management actions related to the impacts, curtailment, or cleanup of plastic pollution may be specified as necessary in recovery or habitat conservation plans. Further, federal agencies must consult with FWS or NMFS on proposals to authorize, fund or carry out an action that "may affect" (including cumulative effects) a listed species or destroy or adversely modify its critical habitat.[602] Consultation may be required for actions such as permitting of petrochemical production plants, authorization of waste disposal sites, use of pesticides,[603] or use

[598] *See supra* ELI Report, Section IV(B)(11).
[599] 16 U.S.C. §§ 1531–1544.
[600] 16 U.S.C. § 1533(a).
[601] *See* 16 U.S.C. §§ 1533(b)(2) (critical habitat), 1533(f) (recovery plans), 1536(a)(2) (consultation), 1538 (taking prohibition), 1539 (incidental take permit).
[602] 16 U.S.C. § 1536(a)(2).
[603] Note, agricultural operations utilize time release pesticides/fertilizers that have polymer coatings resulting in microplastic contamination. *See* Lela Nargi, *Plastic-Coated Agricultural Chemicals are Destroying Human and Planetary Health*, FOODPRINT (July 14, 2022), https://foodprint.org/blog/plastic-coated-agricultural-chemicals/; *About the Endangered Species Protection Program*, U.S. ENVTL. PROT. AGENCY,

of certain plastic fishing gear in marine fisheries. Last, the ESA prohibits the "take" of endangered species and gives the Services discretionary authority to apply these prohibitions to threatened species.[604] Non-federal landowners and managers can obtain a permit to "take" a listed species if that take is incidental to some other lawful activity, such as fishing or infrastructure construction activities.[605] The Services may consider how the use of plastics in relation to activities may result in the "take" of listed species. For example, plastic mesh netting used for erosion control can easily entrap wildlife.[606]

How the Endangered Species Act applies to Intervention 5, capture waste through removal of plastic wastes from wildlife and habitats:
Through habitat conservation plans or other efforts to protect listed species, plastic wastes may be directly removed from habitat or entangled wildlife.

How the Endangered Species Act applies to Intervention 6, minimize ocean disposal by reducing at-sea abandonment or discard of fishing gear:
While the ESA is limited in its ability to directly reduce plastic pollution, it is a strong authority for regulating how plastic pollution impacts species and habitat. It can force agencies to consider and utilize more wildlife-friendly, plastic alternatives when taking actions or issuing incidental take permits for actions that would otherwise introduce plastic into the natural environment.

How the Endangered Species Act applies to Intervention 6, minimize ocean disposal by reducing at-sea abandonment or discard of fishing gear:
Under the ESA, research and management actions related to the impacts, curtailment, or cleanup of plastic pollution may be specified as necessary in recovery or habitat conservation plans. Information gathering about the threats to listed species could provide for the collection of information and data on how plastics impact threatened and endangered species.

e. Marine Mammal Protection Act
(NOAA Fisheries; U.S. Fish and Wildlife Service)

https://www.epa.gov/endangered-species/about-endangered-species-protection-program (last visited Mar. 14, 2024) (describing that "[t]he role EPA has in implementing the ESA is to ensure that the use of pesticides is not likely to jeopardize listed species or destroy or adversely modify their critical habitat when we register pesticides").

[604] 16 U.S.C. § 1538.

[605] 16 U.S.C. § 1539.

[606] WIS. DEP'T. OF NAT. RES., BROAD INCIDENTAL TAKE PERMIT/AUTHORIZATION FOR COMMON ACTIVITIES, STREAMBANK STABILIZATION (Sept. 2019), https://dnr.wisconsin.gov/sites/default/files/topic/ERReview/Streambank_BCFProtocol.pdf.

The Marine Mammal Protection Act (MMPA) of 1972[607] protects all marine mammals in U.S. waters, including dolphins, porpoises, whales, seals, sea lions, walruses, polar bears, sea otters, manatees, and dugong.[608] It recognizes the importance of marine mammals and seeks to restore or maintain populations at healthy and productive levels.[609] The MMPA bans the taking and importation of marine mammals and products, though exceptions can be made through a permitting process for "takes" that are incidental to otherwise lawful activities, including commercial fishing, scientific research, and public displays at institutions such as aquariums.[610] The word "take" is defined as an attempt or act to harass, hunt, capture, or kill.[611] "Harassment" is further defined as an act of pursuit, torment, or annoyance that has the potential to injure, or disturb by causing disruption of behavioral patterns, a marine mammal or marine mammal stock in the wild.[612]

Marine mammals are often injured or killed in commercial fishing operations. The MMPA requires that commercial fisheries reduce their takes of marine mammals to insignificant levels.[613] Further, NOAA Fisheries mandates the collection and reporting of human interaction data for stranded marine mammals, including cases of plastic entanglement and ingestion, gunshot wounds, harassment, and vessel strikes.[614] The MMPA also provides for research grants, gear research and development to reduce impacts to marine mammals, and established the Marine Mammal Commission, which, among other responsibilities, reviews and recommends actions for the protection and conservation of marine mammals.[615]

How the Marine Mammal Protection Act applies to Intervention 6, minimize ocean disposal by reducing at-sea abandonment or discard of fishing gear:
The MMPA allows for NOAA Fisheries to research the effects of plastics, particularly fishing gear, on marine mammals and promulgate regulations to reduce the impacts of plastic pollution on marine mammals and their habitat.

How the Marine Mammal Protection Act supports the interventions through information and data collection:
The MMPA provides for research grants, gear research and development, and established the Marine Mammal Commission, which reviews and recommends actions for the protection and conservation of marine mammals, including those related to the impacts of plastic.

[607] 16 U.S.C. §§ 1361–1362.
[608] *See* Fact Sheet, Oceana, Marine Mammal Protection Act Factsheet (2017), https://usa.oceana.org/wp-content/uploads/sites/4/4046/oceana_mmpa_fact_sheet.pdf.
[609] *Id*. at 1.
[610] 16 U.S.C. § 1371(a)(1), (2).
[611] 16 U.S.C. § 1362(13).
[612] 16 U.S.C. § 1362(18).
[613] *See* 50 C.F.R. §§ 229.1(g)(2), 229.3.
[614] *See* 50 C.F.R. §§ 229.6-229.7.
[615] *See* 16 U.S.C. §§ 1380, 1381, 1401–1402; *see generally Our Mission*, MARINE MAMMAL COMM'N, https://www.mmc.gov/about-the-commission/our-mission/ (last visited Mar. 14, 2024).

f. Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act (MSA) is the federal law governing the management of fisheries in U.S. marine waters. The law's purpose is to ensure sustainable fisheries through science-based conservation and management of ocean resources.[616] The MSA primarily focuses on the health of fish populations and their habitats, and it does not provide direct regulatory authority over ocean pollution or plastics. However, the MSA may indirectly address marine plastic pollution by regulating plastic fishing gear, incentivizing research into the impacts of plastic on fisheries, and having plastic pollution be considered in the requirements of a sustainable fishery.

Under the MSA, when a fishery[617] requires "conservation and management," a regional fishery management council must develop a "Fishery Management Plan" (FMP).[618] Regulations from NMFS, articulate factors to be used in determining whether a fishery requires conservation and management, such as the importance of the fishery to the marine environment, its economic importance, whether it is adequately managed by states or other programs, and the need to resolve competing interests over the use of the fishery.[619] The determination of whether a fishery requires an FMP is mostly left to the fishery management councils, but the MSA allows NMFS to independently draft and implement an FMP if the council has failed to do so after a reasonable period of time and the fishery requires it.[620] To date, there are 45 FMPs managing 492 stocks or stock complexes of fish.[621]

NMFS reviews the conservation and management measures in a proposed FMPs for their consistency with the MSA's ten identified "National Standards."[622] The National Standards potentially relevant to plastic pollution dictate that:

> "(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
> (2) Conservation and management measures shall be based upon the best scientific information available…

[616] *See* 16 U.S.C. § 1801(a)(6), (b)(1), (3).
[617] 16 U.S.C. § 1802(13) (in the MSA, "fishery" is defined as "(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management, and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks").
[618] *See* 16 U.S.C. § 1852(h)(1).
[619] 50 C.F.R. § 600.305(c)(1).
[620] 16 U.S.C. § 1854(c)(1). The eight U.S. Regional Fishery Management Councils were established in 1976 under the MSA to manage fishery resources in federal waters of the U.S. *Fishery Management Councils*, U.S. REGIONAL FISHERY MGMT. COUNCILS, https://www.fisherycouncils.org/ (last visited Mar. 14, 2024).
[621] NAT'L OCEANIC & ATMOSPHERIC ADMIN., STATUS OF STOCKS 2022, ANNUAL REPORT TO CONGRESS ON THE STATUS OF U.S. FISHERIES 3 (Apr. 2023), https://www.fisheries.noaa.gov/sustainable-fisheries/status-stocks-2022.
[622] 16 U.S.C. § 1851.

> (4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation…
> (6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
> (9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch."[623]

NMFS also issues guidance documents clarifying the information and measures that FMPs should contain to satisfy each of the National Standards. These guidance documents show how FMPs can address marine plastic pollution. For example, when determining a fishery's "optimum yield" under the first National Standard, NMFS guidance directs fishery management councils to consider "ecological or environmental conditions that stress marine organisms or their habitat, such as… [the] effects of pollutants on habitat and stocks."[624] Under the sixth National Standard ("Variations and Contingencies"), NMFS clarifies that while FMPs cannot directly regulate marine pollution, they "may address the impact of pollution and the effects of wetland and estuarine degradation on the stocks of fish" by, for example, "identify[ing] causes of pollution and habitat degradation and the authorities having jurisdiction to regulate or influence such activities" and "propos[ing] recommendations that the Secretary will convey to those authorities to alleviate such problems."[625]

NMFS's guidance on the National Standards also provides that NMFS may regulate plastic fishing gear through the MSA and its associated FMPs. Under the fourth National Standard ("Allocations"), for example, NMFS explains that the agency can establish "quotas by . . . gear type" and make "assignment of ocean areas to different gear users."[626]

In 1996, the Sustainable Fisheries Act amended the MSA to add the long-term protection of "essential fish habitat" as one of the MSA's objectives.[627] The 1996 amendments created an additional requirement that FMPs describe and identify essential fish habitats and "minimize to the extent practicable adverse effects on such habitat caused by fishing and identify other actions to encourage the conservation and enhancement of such habitat."[628] Presumably, marine plastic pollution from fishing vessels qualifies as "adverse effects on such habitat caused by fishing."

[623] 16 U.S.C. § 1851(a).
[624] 50 C.F.R. § 600.310(e)(3)(iii)(B)(3).
[625] 50 C.F.R. § 600.335(c)(2)(iv).
[626] 50 C.F.R. § 600.325(c)(1).
[627] 16 U.S.C. §§ 1801(a)(9), (a)(6), (b)(7); *see* Pub. L. No. 104-297 § 101 (amending MSA's findings and purposes).
[628] 16 U.S.C. § 1853(a)(7).

Federal courts have noted that NFMS has significant discretion in deciding how best to comply with this and other MSA requirements that call for balancing conservation and economic interests.[629]

Finally, beyond the required elements on a FMP, section 303(b) of the MSA lists the specific regulations a FMP may include (the so-called "discretionary provisions").[630] Of these authorized measures, the most relevant to plastic pollution is the authority to "prohibit, limit, condition, or require the use of specified types and quantities of fishing gear, fishing vessels, or equipment for such vessels."[631] Other specifically authorized forms of regulation include requiring permits to fish in specific areas, designating zones and periods where fishing will be limited, and limiting the catch size, sale, and transport of fish or fish products.[632]

If an FMP meets the standards identified in the MSA, NMFS implements the FMP through regulation and the FMP becomes legally binding.[633]

How the Magnuson-Stevens Act may be applied to Intervention 6, minimize ocean disposal by reducing at-sea abandonment or discard of fishing gear:
Under the MSA, NMFS has the authority to "minimize to the extent practicable adverse effects on [essential fish habitat] caused by fishing."[634] Through this authority, NMFS can reduce-at sea abandonment of plastic by regulating the type and quantity of allowable fishing gear. NMFS can also require fishery management councils to consider the effects of plastic pollution when crafting the FMPs for the conservation and management of fisheries. NOAA should also issue the Congressionally required report from the Save Our Seas 2.0 Act on the impacts of derelict fishing gear to inform such actions.[635]

D. National Institute for Standards and Technology

1. National Institute of Standards and Technology Act

The National Institute of Standards and Technology (NIST) is part of the Department of Commerce and operates under the authority of the National Institute of Standards and Technology Act.[636] The agency and its programs are reauthorized through various statutes and appropriations. The agency's purpose is to promote U.S. innovation and industrial competitiveness by advancing

[629] *See* Conservation Law Found. v. Ross, 374 F. Supp. 3d 77, at 91 (citing Conservation Law Found. v, Pritzker, 37 F. Supp. 3d 234, at *25 (D.D.C. 2014)); *see also* Oceana, Inc. v. Evans, 2005 WL 555416, at *35 (D.D.C. Mar. 9, 2005).
[630] *See* 16 U.S.C. § 1853(b).
[631] 16 U.S.C. § 1853(b)(4).
[632] *See generally* 16 U.S.C. § 1853(b).
[633] 16 U.S.C. § 1854(b).
[634] 16 U.S.C. § 1853(a)(7).
[635] Save Our Seas Act 2.0, Pub. L. No. 116-224, subtitle D, § 135, 134 Stat. 1085 (2020).
[636] *See* 15 U.S.C. § 271 (the Act amends the Organic Act of March 3, 1901 (ch. 872), which created the National Bureau of Standards).

measurement science, standards, and technology in ways that enhance economic security and improve quality of life.[637] NIST is a nonregulatory federal agency and carries out its mission in various ways.[638]

NIST laboratories conduct research to advance the U.S. technological infrastructure; the Baldrige National Quality Program helps U.S. businesses and other organizations improve the performance and quality of their operations; the Hollings Manufacturing Extension Partnership helps smaller firms adopt new manufacturing and management technologies; and the Technology Innovative Program provides cost-shared awards to industry and other institutions for high-risk, high-reward research in areas of critical national need.[639] NIST also plays a vital role in domestic and international standards-setting.

a. Material Measurement Laboratory

One of NIST's laboratories, the Material Measurement Laboratory (MML), "conducts measurement science across the chemical, biological, and material sciences."[640] MML's "activities range from fundamental to applied research to the development and dissemination of certified reference materials and data to industry, academia, and other government agencies to assure the quality of measurement results."[641] Nested within MML is the Materials Measurement and Science Division (MMSD), the mission of which is to, in part, "develop purposeful solutions to critical, uniquely challenging materials science problems."[642]

i. Microplastic and Nanoplastic Materials Metrology Focus Area

Acutely relevant to addressing plastic pollution is one of MMSD's primary focus areas, "(MNP) Metrology Focus Area," which is dedicated to the "measurement science needed to improve detection, identification, and quantification of plastic particles in environmental and human health systems."[643] The MNP Focus Area works to develop "protocols for reproducible material production that facilitate measurement science advancement and needed metrology to examine MNP particle evolution in solution and airborne environments using advanced microscopy, spectroscopy, and mass spectrometry techniques."[644]

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[637] *About NIST*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/about-nist (last visited Mar. 14, 2024); *see generally* 15 U.S.C. §§ 271–272.
[638] *National Institute of Standards and Technology*, FED. REG., https://www.federalregister.gov/agencies/national-institute-of-standards-and-technology#:~:text=NIST%20is%20a%20nonregulatory%20Federal,improve%20the%20quality%20of%20life. (last visited Mar. 14, 2024).
[639] *Id*.
[640] *Material Measurement Laboratory*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/mml (last visited Mar. 14, 2024).
[641] *Id*.
[642] *Materials Measurement Science Division*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/mml/mmsd (last visited Mar. 14, 2024).
[643] *Micro and Nano Plastics*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/mml/mmsd/primary-focus-areas/micro-and-nano-plastics (last visited Mar. 14, 2024).
[644] *Id*.

ii. Circular Economy Program

The Circular Economy Program (CEP), one of MMSD's subprograms, is directly relevant to advancing the science to improve the life cycle of plastics. The CEP works to support "the nation's transition to an economy based on materials that repeatedly cycle within the economy and retain their value, reducing or eliminating waste and pollution."[645] Through its CEP, NIST provides its expertise to governments, industries, and consumers to fill the gaps in the materials, data, and measurement science fields that must be addressed to "effectively design out most waste."[646]

In practice this might look like CEP's recent conference—developed in collaboration with EPA, NOAA, DOE, USDA, and others—that convened "stakeholders from across the polymers/plastics value chain to identify data gaps, understand strengths and weaknesses of existing reporting structures, share insights on evaluative methods (e.g., environmental benchmarking, life cycle assessment), and develop a roadmap for infrastructure to support data-drive solutions."[647] Other CEP efforts, in conjunction with NIST's Applied Economics Office, include research resources, such as the "Cost-Effective Environmental Sustainability: A Focus on the Circular Economy" report, which "examines the economics of circular economy" and analyzes three primary needs for plastics recycling.[648] They are:

(1) the need to aggregate streams to increase volume and economies of scale (i.e., reducing the number of plastic types, standards for additives in plastics, standards for tracking additives in plastics);
(2) standards or technologies for a low cost means for separating post-consumer plastic types and preventing/removing contaminants; and
(3) ability to differentiate product brands and models by recyclability.[649]

Also under CEP is the Polymer Science project, which is developing measurement methods that focus on the processing steps that occur when making recycled goods. [650] Through these efforts, the Polymer Science project is also examining contamination by mixed plastics waste streams.[651] Another project, Polymer Analytics, is contributing to the Polymer Property Predictor and Database and working to improve characterization of a common polymer through simulation techniques and

[645] *Material Measurement Laboratory Selected Programs and Initiatives*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/mml/selected-programs-and-initiatives (last visited Mar. 14, 2024).
[646] *Circular Economy,* NAT'L INST. OF STANDARDS & TECH, *https://www.nist.gov/circular-economy* (last visited Mar. 14, 2024).
[647] Nat'l Inst. of Standards & Tech., Data Harmonization to Improve the Circularity of Plastics, Virtual Conference (Jan. 24–26, 2023).
[648] DOUGLAS S. THOMAS, NAT'L INST. OF STANDARDS & TECH, COST-EFFECTIVE ENVIRONMENTAL SUSTAINABILITY: A FOCUS ON THE CIRCULAR ECONOMY (2022).
[649] *Circular Economy: Recycling*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/el/applied-economics-office/manufacturing/circular-economy/recycling (last visited Mar. 14, 2024).
[650] *Circular Economy, Polymer Science*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/circular-economy/polymer-science (last visited Mar. 14, 2024).
[651] *Id*.

machine learning.[652] The Polymer Analytics project addresses the circular economy by investigating "how to improve near infrared measurements of polyolefins through correlation with slower measurement techniques."[653]

How the National Institute of Standards and Technology Act may apply to Intervention 2, innovation of material and product design through voluntary commitments and collaborations:
NIST-funded research and recommendations can continue to inform the measurement science, standards, and technology used to address plastic pollution and improve human health.

How the National Institute of Standards and Technology Act may support the interventions through research and development activities:
The research programs and projects concerning plastics carried out by NIST are vital to efforts to reduce plastic pollution at all stages of the plastic life cycle—from production practices and polymer compounds, to recyclability, microplastic and nanoplastic detection, circular economy efforts, etc.

E. Department of the Interior

1. National Park Service

a. National Park Service Organic Act of 1916 and National Park Service General Authorities Act of 1970, as amended by the Redwood National Park Expansion Act of 1978

The National Park Service Organic Act of 1916 established the National Park Service (NPS) in the Department of the Interior to oversee national parks, monuments, and reservations—the creation of which was authorized under the Antiquities Act of 1906.[654] The Act directs the NPS to:

> promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the

[652] *Polymer Analytics*, NAT'L INST. OF STANDARDS & TECH., https://www.nist.gov/programs-projects/polymer-analytics (last visited Mar. 14, 2024).
[653] *Id*.
[654] NAT'L PARK SERV., MANAGEMENT POLICIES 8 (2006), https://www.nps.gov/subjects/policy/upload/MP_2006.pdf.

enjoyment of future generations.[655]

The NPS General Authorities Act of 1970 (as amended by the Redwood National Expansion Act of 1978), prohibits the NPS from "allowing any activities that would cause derogation of the values and purposes for which the parks have been established (except as directly and specifically provided by Congress)."[656]

Taken together, the two acts are considered to provide the "statutory directive" of the National Park Service,[657] which includes a mandate to "protect park resources and values" and "actively manage all park uses."[658]

i. Beach Cleanup and Education Programs

The National Park Service works with local, state, and other federal partners (such as NOAA's Marine Debris Program) on beach cleanups and educational products and programs to help inform park visitors of the environmental impacts of plastics pollution and marine debris, and how individual choices and actions can make a difference.[659]

How the NPS beach cleanup programs apply to Intervention 5, capture waste by removing plastic waste from waterways and `the environment:
While the program is narrow in scope, it removes plastic waste from National Park lands and waters, directly benefiting some of the nation's most protected areas. Increasing these efforts and fostering partnerships with local, state, and other federal agencies could expand the cleanup and education programs to have a larger impact.

How the NPS beach cleanup and education programs may support the interventions through education and outreach activities:
As stated above, strengthening efforts and fostering partnerships could expand the cleanup and education programs to have a larger impact.

2. Fish and Wildlife Service

a. Endangered Species Act and Marine Mammal Protection Act

[655] *Id*. at 10 (quoting 16 U.S.C. § 1).
[656] *Id.* at 98.
[657] *Id*. at 98.
[658] *Id*.
[659] *See generally, Ocean Plastics*, NAT'L PARK SERV., https://www.nps.gov/subjects/oceans/ocean-plastics.htm (last visited Mar. 14, 2024); *Coastal Cleanup Events*, NAT'L PARK SERV., https://www.nps.gov/subjects/oceans/coastal-cleanup.htm (last visited Mar. 14, 2024); *Teaming Up to Tackle Trash*, NAT'L PARK SERV., https://www.nps.gov/subjects/oceans/marine-debris.htm (last visited Mar. 14, 2024).

These authorities fall under the purview of the U.S. Fish and Wildlife Service in addition to NOAA Fisheries, and are discussed in turn under the National Oceanic and Atmospheric Administration section above.[660]

3. Bureau of Safety and Environmental Enforcement

a. Outer Continental Shelf Lands Act

The Outer Continental Shelf Lands Act (OCSLA) is the federal law providing for the regulation of submerged lands lying in coastal waters under U.S. jurisdiction.[661] In particular, the law directs the Department of the Interior to administer and regulate mineral exploration and energy development in the outer continental shelf.[662] OCSLA also provides for conditions and limitations to such development, some of which are relevant to marine debris and plastic pollution.

i. Marine Trash and Debris Program

As authorized under the OCSLA and pursuant to its implementing regulations, the U.S. Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE) is responsible for oversight and enforcement of measures to prevent, control, and remove the unauthorized discharges of pollutants into offshore waters caused by oil, gas, and sulfur operations.[663] Because such operations may contribute to marine debris and trash pollution, BSEE's Marine Trash and Debris Program specifically requires offshore energy industry operators to conduct annual training for employees and follow best practices to reduce marine debris.[664] 30 C.F.R. § 250.300(a) and (b)(6) prohibit the discharge or disposal of equipment, cables, chains, containers, or other materials into the marine environment, and 30 C.F.R. § 250.300(c) and (d) require operators to make durable identification markings on skid-mounted equipment, portable containers, spools or reels, and drums, and record and report such items when lost overboard. For example, a program notice for existing and future oil and gas operators in the Gulf of Mexico Outer Continental Shelf specifically states that, "in accordance with 30 [C.F.R. §] 250.300(a) and (b)(6), [operators] should exercise special caution when [they] handle and transport small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass that can be lost in the marine environment and washed ashore."[665]

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[660] *See infra* ELI Report, at Sections IV(C)(d)–(e).
[661] Outer Continental Shelf Lands Act, 43 U.S.C. §§ 1331–1356c; *OCS Lands Act History*, BUREAU OF OCEAN ENERGY MGMT., https://www.boem.gov/oil-gas-energy/leasing/ocs-lands-act-history (last visited Mar. 14, 2024).
[662] *OCS Lands Act History*, *supra* note 661.
[663] 30 C.F.R. § 250.300(a).
[664] *Marine Trash and Debris Program,* BUREAU OF SAFETY & ENVTL. ENF'T, https://www.bsee.gov/what-we-do/environmental-compliance/environmental-programs/marine-trash-and-debris-program (last visited Mar. 14, 2024).
[665] BUREAU OF SAFETY & ENVTL. ENF'T, NOTICE TO LESSEES AND OPERATORS (NTL) OF FEDERAL OIL, GAS, AND SULFUR LEASES AND PIPELINE RIGHT-OF-WAY HOLDERS IN THE OCS, GULF OF MEXICO REGION (Dec. 17, 2015), https://www.bsee.gov/sites/bsee.gov/files/notices-to-lessees-ntl/alerts/ntl-2015-g03.pdf.

How the Outer Continental Shelf Lands Act and Marine Trash and Debris Program may be applied to Intervention 5, capture waste through the removal of plastic waste from the environment:

In addition to efforts taken under the Marine Trash and Debris Program to educate and train employees of offshore energy industry operators, BSEE may exercise its full authority under § 30 C.F.R. 250.300. This includes requiring that "immediate corrective action [] be taken in all cases where pollution has occurred," including recovery and removal of plastic waste and marine debris.[666] If the polluting party fails to control and remove the pollution, BSEE, in coordination with Federal, State, and local governments, can control and remove the pollution at the polluter's expense.[667]

How the Outer Continental Shelf Lands Act and Marine Trash and Debris Program may be applied to Intervention 6, minimize ocean disposal through increased enforcement for at-sea disposal:

Exercising its full authority under to 30 C.F.R. § 250.300, BSEE could improve training, reporting, control, and removal requirements, and oversight and enforcement of those requirements, to better prevent, regulate, and remove marine trash and debris.[668] Further, BSEE must ensure that corrective action is taken in all cases where pollution has occurred either by the polluter or at the polluter's expense.[669]

How the Outer Continental Shelf Lands Act and Marine Trash and Debris Program may support the interventions through education and outreach activities:

Because BSEE's Marine Trash and Debris Program specifically requires offshore energy industry operators to conduct annual training for employees and follow best practices to reduce marine debris, this serves as an opportunity to educate individuals on the scope of the program, the regulations, and impacts of plastics on the marine environment.

F. Federal Trade Commission

1. Federal Trade Commission Act

[666] 30 C.F.R. § 250.300(a)(1).
[667] 30 C.F.R. § 250.300(a)(2).
[668] *See* 30 C.F.R. § 250.300(d); *see, e.g.,* BUREAU OF SAFETY & ENVTL. ENF'T, NOTICE TO LESSEES AND OPERATORS (NTL) OF FEDERAL OIL, GAS, AND SULFUR LEASES AND PIPELINE RIGHT-OF-WAY HOLDERS IN THE OCS, GULF OF MEXICO REGION (Dec. 17, 2015), https://www.bsee.gov/sites/bsee.gov/files/notices-to-lessees-ntl/alerts/ntl-2015-g03.pdf.
[669] 30 C.F.R. § 250.300(a)(1)(2).

The Federal Trade Commission Act (FTCA) is the enabling statute of the Federal Trade Commission (FTC).[670] Under the FTCA, the FTC is empowered to protect the public from deceptive or unfair business practices and unfair methods of competition through enforcing civil antitrust and other consumer protection laws.[671] The FTCA does not give the Commission authority over plastics specifically, but the Commission's general authority over deceptive or unfair business practices limits the environmental claims plastic manufacturers can make about their products.

a. Guides for the Use of Environmental Marketing Claims ("Green Guides")

Section 5 of the FTCA prohibits "unfair or deceptive acts or practices in or affecting commerce."[672] In furtherance of this mandate, the FTC has developed nonbinding "Green Guides," that "are designed to help marketers ensure that the claims they make about the environmental attributes of their products are truthful."[673] The Green Guides are binding on neither the FTC nor the public; however, FTC can nonetheless pursue enforcement actions against marketers who violate FTCA section 5.

The Green Guides thus serve as a helpful guidepost in understanding FTC's position on deceptive or unfair practices specifically as they pertain to environmental claims "in labeling, advertising, promotional materials, and all other forms of marketing in any medium, whether asserted directly or by implication, through words, symbols, logos, depictions, product brand names, or any other means."[674] Several examples of deceptive marketing practices within the Green Guides have a limited nexus to plastic, as plastic products and packaging are used frequently as illustrative examples of products that are susceptible to violating Section 5 of the FTC if they are marketed with misleading claims, such as "recyclable," "photodegradable," or "degradable."[675]

The FTC is empowered to issue guidance documents like the Green Guides discussed above. The Green Guides communicate the agency's position and, in so doing, create nonbinding standards that the agency will use to inform its administration of the FTCA. Though guidance documents do not carry the force or effect of law, guidance, like the Green Guides, is interpretive in nature. Here, the guidance articulates the FTC's position on the existing legal requirements—those practices prohibited under section 5 of the FTCA—within the context of environmental attributes of products subject to the FTCA.

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[670] *Federal Trade Commission Act*, FED. TRADE COMM., https://www.ftc.gov/legal-library/browse/statutes/federal-trade-commission-act (last visited Mar. 14, 2024).
[671] *About the FTC*, FED. TRADE COMM., https://www.ftc.gov/about-ftc#:~:text=The%20FTC%20is%20a%20bipartisan%20federal%20agency,that%20champions%20the%20interests%20of%20American%20consumers (last visited Mar. 14, 2024).
[672] 15 U.S.C. § 45.
[673] *FTC Issues Revised "Green Guides" Will Help Marketers Avoid Making Misleading Environmental Claims,* FED. TRADE COMM'N (Oct. 1, 2012), https://www.ftc.gov/news-events/news/press-releases/2012/10/ftc-issues-revised-green-guides.
[674] 16 C.F.R. § 260.1(c).
[675] Note, "marine biodegradable" is another misleading label that is not currently included in the list of regulated claims. The label is not allowed to be used in California, Washington, and Maryland due to lack of scientific evidence substantiating the claims.

How the Federal Trade Commission Act may be applied to Intervention 2, innovate material and product design through standards for labeling and marketing:
The FTC is empowered to create nonbinding standards for marketers subject to the FTCA against deceptive marketing claims of environmental attributes of products. The FTC can pursue enforcement actions against violations of the FTCA, which, here, would be informed by the guidance articulated in the Green Guides. The FTC can address plastic recyclability through these standards. For example, in comments on the then-proposed Green Guides, EPA and other organizations suggested ways in which the Green Guides could be updated and/or improved to help address plastic recycling and build a more circular economy. Suggestions included: reconsidering the 60 percent substantial majority threshold for unqualified recycling claims; clarifying that products and packaging may only be marketed as recyclable if they have a strong end market; revisiting the categorization of plastic recyclability by resin identification code; increasing transparency in and substantiation of environmental marketing and benefit claims; and restricting the use of terms "degradable," "biodegradable," "marine biodegradable," "oxo-degradable," "oxo-biodegradable, or photodegradable."[676]

G. Department of the Treasury

1. Internal Revenue Service

a. Internal Revenue Code – Title 26

Codified at Title 26 of the U.S. Code, frequently referred to as the Internal Revenue Code (IRC), is the domestic section of U.S. federal tax law.[677] It details most domestic tax policies in the U.S., including income taxes, employment taxes, estate taxes, and more.[678] The IRC contains several tax policies that either disincentivize or incentivize plastic material innovation. The following section summarizes these tax policies and how they could affect the market for plastic alternatives.[679]

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[676] *See generally* U.S. Envtl. Prot. Agency, Comments on FTC's Proposed Rule "Guides for the Use of Environmental Marketing Claims," Docket Id. No. 2022-27558 (Apr. 20, 2023) (available at https://www.regulations.gov/comment/FTC-2022-0077-1366).

[677] 26 U.S.C. §§ 1–9834.

[678] *See, e.g.*, Subtitle A – Income Taxes, 26 U.S.C. §§ 1–1564, Subtitle B – Estate and Gift Taxes, 26 U.S.C. §§ 2001–2801, Subtitle C – Employment Taxes, 26 U.S.C. §§ 3101–3512.

[679] Note, as detailed in the NASEM Report, the federal tax subsidies for the fossil fuel industry make plastic feedstocks derived from fossil fuels a profitable option in plastic manufacturing. NASEM Report, *supra* note 6, at 34. Several direct and indirect subsidies are available to the fossil fuel industry. These tax breaks may be an area worthy of legislative reconsideration in an effort to make primary plastic production less profitable. The Environmental and Energy Study Institute has compiled a list of fossil fuel subsidies; a representative sample includes: 26 U.S.C. § 613A—permitting percentage depletion in the case of oil and gas wells; 26 U.S.C. § 263(c)—permitting the deduction of expenses of intangible drilling and development costs in the case of oil

i. Federal Tax Breaks for Research and Development

The federal research and development (R&D) tax credit is a general federal incentive that could be used to promote industry-wide innovation in the plastics industry, particularly for plastics manufacturing. Briefly, the R&D tax credit—"Credit for Increasing Research Activities"—can be claimed by qualified companies for "qualified research activities" and "basic research requirements."[680] Examples of activities that may qualify for this credit include the development of new products or improvements to existing products. Companies that engage in activities to improve plastic material design and manufacturing could likely qualify for this credit.

How federal tax breaks may apply to Intervention 2, innovate material and product design through voluntary commitments and collaborations:
The federal research and development tax credit, 26 U.S.C. § 41, may be available to qualified plastic manufacturers to improve plastic material design and manufacturing processes.

H. National Aeronautics and Space Administration

1. National Aeronautics and Space Act of 1958 and subsequent NASA Authorization Acts

The National Aeronautics and Space Act is the enabling act for the National Aeronautics and Space Administration (NASA), providing the agency its general purpose and detailing the scope of its authorities. As seen in the National Aeronautics and Space Administration Act of 2022, the intent of Congress for NASA is that well-funded "research and analysis grant programs, technology development, suborbital research activities, and small, medium, and large space missions . . .

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and gas wells and geothermal wells; and 26 U.S.C. § 7704—defining when publicly traded partnerships shall be treated as corporations.

Fossil Fuel Subsidies: A Closer Look at Tax Breaks and Societal Costs, ENVTL. & ENERGY STUDY INST. 2–3 (July 29, 2019), https://www.eesi.org/files/FactSheet_Fossil_Fuel_Subsidies_0719.pdf (explaining that "many oil and gas companies are structured as Master Limited Partnerships (MLP), which combines the investment advantages of publicly traded corporations with tax benefits of partnerships. While shareholders still pay personal income tax, the MLP itself is exempt from corporate income taxes. More than three-quarters of MLPs are fossil fuel companies. This provision is not available to renewable energy companies.").

From a holistic perspective, federal tax subsidies (e.g., 26 U.S.C. §§ 613A, 263(c), 7704) for the fossil fuel industry may make primary plastic production less profitable, which could drive innovative material and product design (intervention 2). It is conceivable that, in doing so, alternative feedstocks (e.g., recycled, bio-based, etc.) could be more a viable option for plastic production and manufacturing. A comprehensive review of how the repeal of some or all fossil fuel subsidies could affect other federal efforts to facilitate a circular plastic economy is needed but beyond the scope of this report.

[680] 26 U.S.C. § 41.

serve[] as a catalyst for innovation and discovery."[681] NASA's Science Mission Directorate (SMD) administers several of these research and analysis grant programs. Some of these grants can fund activities relevant to plastic pollution, such as the recent efforts to use NASA satellites to detect microplastics. A subdivision of SMD has also developed an innovative method of detecting ocean debris and plastics.

a. Application of Deep Learning Models for Marine Debris Detection

Housed under NASA's SMD is the Earth Science Data Systems (ESDS) Program.[682] ESDS is comprised of several programs. Included among them is NASA's Interagency Implementation and Advanced Concepts Team (IMPACT): an "interdisciplinary team that works to further ESDS's goal of overseeing the lifecycle of Earth science data to maximize the scientific return of NASA's missions and experiments for research and applied scientists, decision makers, and the society at large."[683] In 2021, IMPACT developed an application of "a deep learning model designed for object detection in the TensorFlow framework for observing marine debris floating on the surface of the ocean."[684] IMPACT team members, Lilly Thomas and Ankur Shah,

> curated a dataset for this deep-learning[—consisting of 1370 bounding boxes of marine debris which were validated using peer-reviewed studies—]of visible marine debris using ImageLabeler on scenes from the Planetscope satellite. An object detection deep learning model was trained on the [IMPACT team's] curated dataset and initial results on Planetscope's optical imagery were obtained.[685]

This IMPACT team's open-source code is available on GitHub, may help to locate ocean debris and ocean plastics globally, and could "also be used to detect other phenomena on Earth using satellite imagery."[686]

b. Satellite Detection of Microplastics

Researchers at the University of Michigan have used data from eight microsatellites that are part of NASA's Cyclone Global Navigation Satellite System (CYGNSS) to develop a new method to map the

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[681] National Aeronautics and Space Authorization Act, Pub. L. No. 117-167, 136 Stat. 1730; 51 U.S.C. § 20102 note (Aug. 9, 2022).
[682] *Earth Science Data Systems (ESDS) Program*, NASA EARTHDATA, https://www.earthdata.nasa.gov/esds (last visited Mar. 14, 2024).
[683] *Interagency Implementation and Advanced Concepts Team (IMPACT)*, NASA EARTHDATA, https://www.earthdata.nasa.gov/esds/impact (last visited Mar. 14, 2024).
[684] Lilly Thomas & Ankur Shah, Marine debris detection with commercial satellite imagery and deep learning (May 2021) (code available at https://github.com/NASA-IMPACT/marine_debris_ML?tab=License-1-ov-file).
[685] *Machine Learning-Based Marine Debris Detection on High Resolution Satellite Imagery*, NAT'L AERONAUTICS & SPACE ADMIN. (May 20, 2021), https://science.msfc.nasa.gov/2021/05/20/machine-learning-based-marine-debris-detection-on-high-resolution-satellite-imagery/.
[686] Emily Cassidy, *Tracking Ocean Plastic From Space*, NASA EARTHDATA (Dec. 3, 2021), https://www.earthdata.nasa.gov/learn/articles/ocean-plastic.

concentration and movement microplastics in the oceans worldwide.[687] Microplastics often form when plastic waste in the ocean breaks down from the ocean waves or the sun's rays, and can be carried hundreds or thousands of miles away by currents, making it difficult to track and remove the pollution. This satellite-based tracking tool has been a major improvement on tracking methods, which otherwise rely on reports from plankton trawlers that net microplastics along with their catch.[688] NASA is funding research on the use of satellites to detect microplastics in the oceans.[689] This includes using hyperspectral remote sensing, a capability that is an important part of the upcoming PACE (Plankton, Aerosol, Cloud, ocean Ecosystem) mission.[690]

How NASA projects and programs may apply to Intervention 5, innovate material and product design through identifying plastic waste localized hotspots:
Projects and programs funded by NASA to develop new methods and identify plastic waste hotspots are important to the eventual removal of plastic pollution from the oceans. NASA can continue to support, develop, and expand such projects and programs. Initiatives that advance knowledge transfer and information sharing, such as the IMPACT team's open-source code to detect marine debris, may help to accomplish this goal as well.

I. National Science Foundation

1. National Science Foundation Act

The National Science Foundation Act of 1950 (NSFA) is the organic act for the independent federal agency, the National Science Foundation (NSF).[691] The basic objective of NSF as established by the NSFA is to "strengthen basic research and education in the sciences, including independent research by individuals, throughout the United States, including its Territories and possessions, and to avoid undue concentration of such research and education."[692] Other statutes and codified sections of legislation authorize and make appropriations to NSF.[693] Under the act, NSF is authorized to "initiate and support scientific and engineering activities . . . by making contracts or

[687] *Id*.
[688] Samuel Webb, *NASA-funded mission tracks ocean microplastics from space*, INDEPENDENT (Feb. 9, 2023), https://www.independent.co.uk/climate-change/news/nasa-ocean-microplastics-tracking-space-b2278974.html.
[689] *Id*. There is also the potential to monitor microscopic atmospheric concentrations given unique reflectivity and infrared absorption properties of microplastic. We could be monitoring microplastic from transportation, wastewater treatment plant sludge, wind driven erosion, and ocean spray. *See generally* Anna C. Ryan et al. *Transport and Deposition of Ocean-sourced Microplastic Particles by a North Atlantic Hurricane*, 4 COMMC'NS EARTH & ENV'T 442 (2023) (discussing atmospheric transport of microplastics).
[690] *U.S. Actions to Address Plastic Pollution*, *supra* note 11.
[691] National Science Foundation Act of 1950, Pub. L. No. 81-507 (1950); 42 U.S.C. §§ 1861–1887.
[692] *Id*.
[693] *See NSF Authorizing Legislation and Rules*, NAT'L SCI. FOUND., https://www.nsf.gov/od/ogc/leg.jsp (last visited Mar. 14, 2024) (explaining that NSF is governed by the Science and Engineering Equal Opportunities Act).

other arrangements (including grants, loans, and other forms of assistance) for the conduct of such activities."[694]

In furtherance of this authorization, NSF administers several programs to develop bodies of research and education on a variety of issues. The following discussion provides a brief overview of some of NSF's programs related to plastic pollution and marine debris.

a. Directorate for Engineering

The Directorate for Engineering (ENG) is one research area funded by NSF and "has enriched the understanding of natural systems, enhanced electronics, fortified the nation's infrastructure and introduced the excited possibilities of engineering to the next generation."[695] ENG is comprised of several subdivisions, including: (1) Chemical, Bioengineering, Environmental, and Transport Systems; (2) Civil, Mechanical, and Manufacturing Innovation; (3) Electrical, Communications and Cyber Systems; (4) Engineering Education and Centers; and (5) Emerging Frontiers and Multidisciplinary Activities.

i. Chemical, Bioengineering, Environmental, and Transport Systems

The mission of the Chemical, Bioengineering, Environmental, and Transport Systems (CBET) is to "support innovative research and education in the fields of chemical engineering, biotechnology, bioengineering, and environmental engineering, and in areas that involve the transformation and/or transport of matter and energy by chemical, thermal, or mechanical means."[696]

Research topics related to plastic pollution and marine debris that CBET has recently funded include:

- "Regimes of particle settling for finite-sized particles in the inertial range of turbulence;"
- "Real time analysis of impact of nanoplastics on marine species using AI integrated microfluidics;"
- "Engineering increased activity of cutinase toward poly(ethyleneterephthalate) for recycling of plastic;" and
- "Bridging the gaps among commodity thermoplastics, engineering polymers and thermosets via thermally reversible crosslinking."[697]

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[694] 42 U.S.C. § 1862(b).

[695] *About the Directorate for Engineering*, NAT'L SCI. FOUND., https://www.nsf.gov/eng/about.jsp (last visited Mar. 14, 2024).

[696] *About the Division of Chemical, Bioengineering, Environmental, and Transport Systems*, NAT'L SCI. FOUND., https://www.nsf.gov/eng/cbet/about.jsp (last visited Mar. 14, 2024).

[697] PowerPoint Presentation by Christina Payne, Prog. Dir. Nat'l Sci. Found., to Interagency Marine Debris Coordinating Committee, *National Science Foundation (NSF) Efforts to Address Plastic Pollution & Marine Debris*, slide 5, https://marinedebris.noaa.gov/sites/default/files/events/230215%20-%20IMDCC%20meeting%20NSF%20update.pdf (last visited Mar. 14, 2024) [hereinafter *NSF Efforts to Address Plastic Pollution & Marine Debris*].

ii. Civil, Mechanical, and Manufacturing Innovation

The Civil, Mechanical, and Manufacturing Innovation (CMMI) aims to integrate research and education to enable advances in, among others, "manufacturing and building technologies across size scales from nanometers to kilometers, with emphases on efficiencies, economy, and minimal environmental footprint."[698] Topics of recent research awards NSF has identified as related to addressing plastic pollution include: "actuating and sensing objects on a free surface" and "shared autonomy for the dull, dirty, and dangerous: exploring division of labor for humans and robots to transform the recycling sorting industry."[699]

b. Directorate for Mathematical & Physical Sciences

The mission of the NSF's Directorate for Mathematical & Physical Sciences is "to harness the collective efforts of the mathematical and physical sciences communities to address the most compelling scientific questions, educate the future advanced high-tech workforce, and promote discoveries to meet the needs of the [U.S.]."[700] It is comprised of several divisions, including: (1) the Divisions of Astronomical Sciences; (2) Chemistry; (3) Materials Research; (4) Mathematical Sciences; (5) Physics; and (6) Multidisciplinary Activities.[701]

i. Division of Chemistry

The mission of NSF's Division of Chemistry is "to support innovative research in chemical sciences, integrated with education, through strategic investment in developing a globally engaged U.S. chemistry workforce reflecting the diversity of America."[702] Topics of recent research awards NSF-Division of Chemistry has identified as related to addressing plastic pollution include:

- "Radical-induced Weathering of Micro- and Nanoplastics in Water: Impacts on Suspensions, Agglomerations, and Contaminant Adsorptions;"
- "Effect of Sunlight on Fate and Transport of Nanoplastics and Associated Organic Pollutants in Aquatic Systems;"
- "Molecular Probing Surface Reactivity Dynamics of Native versus Photo-Oxidized Microplastics and Nanoplastics in Environmental Aqueous Media;" and
- "Understanding the Dispersibility of Aging Micro/Nanoplastics."

ii. Division of Materials Research

The Division of Materials Research (DMR) "invests in the discovery, prediction, and design of new materials and the explanation of materials phenomena, as well as in the development of the next

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[698] *About the Division of Civil, Mechanical, and Manufacturing Innovation*, NAT'L SCI. FOUND., https://www.nsf.gov/eng/cmmi/about.jsp (last visited Mar. 14, 2024).
[699] *NSF Efforts to Address Plastic Pollution & Marine Debris*, *supra* note 697, at slide 5.
[700] *About Directorate for Mathematical & Physical Sciences*, NAT'L SCI. FOUND., https://www.nsf.gov/mps/about.jsp (last visited Mar. 14, 2024).
[701] *Id*.
[702] *About Chemistry*, NAT'L SCI. FOUND., https://www.nsf.gov/mps/che/about.jsp (last visited Mar. 14, 2024).

generation of materials scientists, which includes increasing the pathways for participation by underrepresented minorities."[703] Housed within DMR are several subprograms. One of the relevant DMR programs for the purpose of this report is the Polymers Program.

The DMR Polymers Program funds a variety of research projects and is directed by a

> [c]entral goal [of] developing and advancing the foundations of polymer science across the wide horizon of the polymer field through innovative research and education projects. Polymers are studied from the molecular level through the nano-to-macro continuum using fundamental materials-focused scientific approaches. Such approaches are experimental but may also partly integrate theoretical, modeling, or computational aspects.[704]

NSF can continue to exercise its funding authority to develop interdisciplinary understandings of polymeric science, which is directly relevant to addressing the plastic pollution crisis, including improvement of plastic waste management. For example, NSF has already funded several projects that address plastic waste, such as a "climate-friendly process to upcycle polystyrene"—which uses light, oxygen, and an iron-based catalyst to convert polystyrene into benzoic acid—that may help to reduce the volume of plastic waste streams.[705] Additional research topics funded by DMR and related to plastic pollution include the "Origins of Secondary Nanoplastics and Mitigating their Creation."[706]

c. Directorate for Geosciences

The mission of the Directorate of Geosciences (GEO) is "to fund the development of knowledge and technological innovations to (1) understand and adapt to the changes in our earth, ocean, and atmosphere, (2) accelerate the societal benefits of our investments, and (3) train a diverse and inclusive geosciences workforce."[707] GEO is comprised of several divisions, included among them are the Division of Atmospheric and Geospace Sciences, Division of Earth Sciences, Division of Ocean Sciences, Division of Polar Programs, and Division of Research, Innovation, Synergies, and Education.

i. Division of Earth Sciences

[703] *About DMR*, NAT'L SCI. FOUND., https://www.nsf.gov/mps/dmr/about.jsp (last visited 4, 2024).
[704] *Division of Materials Research: Polymers Synopsis*, NAT'L SCI. FOUND., https://new.nsf.gov/funding/opportunities/polymers (last visited Mar. 14, 2024).
[705] Jason Bates, *NSF grantees solving problems created by single-use plastics,* NAT'L SCI. FOUND., https://new.nsf.gov/science-matters/nsf-grantees-solving-problems-created-single-use (Oct. 5, 2022).
[706] *NSF Efforts to Address Plastic Pollution & Marine Debris*, *supra* note 697, at slide 7.
[707] *About GEO*, NAT'L SCI. FOUND., https://www.nsf.gov/geo/about.jsp (last visited Mar. 14, 2024).

The Division of Earth Sciences (EAR) is primarily dedicated to the advancement of the "fields of 'solid-earth' science, [meaning] geology, geochemistry, geophysics, and continental hydrology."[708] EAR has funded recent research that will examine "microplastics in snow-dominated environments [and their] sources, transport and fate."[709] Additional research related to plastic pollution that EAR has funded includes the examination of "the effect of environmental systems conditions on degradation pathway and sorption potential of microplastics and nanoplastics as vectors for inorganic pollution."[710]

ii. Division of Polar Programs

NSF's Division of Polar Programs (OPP) "promotes creative and innovative science research, engineering, and education in and about the polar regions, catalyzing fundamental discovery and understanding of polar systems and their global interactions to inform the nation and advance the welfare of all people."[711] Recent OPP-funded work related to plastics pollution is analyzing the "sea ice-ocean exchange of Arctic microplastics, linking small scales to the large-scale system."[712]

iii. Division of Ocean Sciences

NSF's Division of Ocean Sciences (OCE) is charged with supporting research that advances the "understanding of all aspects of the global oceans and ocean basins, including their interactions with the people and the integrated Earth system."[713] OCE has recently funded several areas of research related to marine debris and plastic pollution. The topics of these research projects include: "assessing the contribution of plastics to marine particulate organic carbon;" "Lagrangian transport and patchiness of buoyant material in estuarine systems;" "spatio-temporal variability of microplastics in ocean and river cores using fluorescence microscopy;" and "MRI: acquisition of a Raman spectrometer for ocean acidification and marine debris research."[714]

How NSF may support the interventions through research and development activities:
NSF has authority to award funding to interdisciplinary research and education projects that seek to address plastic pollution and marine debris. For example, NSF has already exercised this federal lever to assist research efforts that seek to: (1) address the volume of plastic waste streams, which may help improve general waste management strategies (relating to intervention 4); and (2) develop scientific literacy in the fate and transportation of microplastics and nanoplastics in marine environments.

[708] *About Earth Sciences*, NAT'L SCI. FOUND., https://www.nsf.gov/geo/ear/about.jsp (last visited Mar. 14, 2024).
[709] *NSF Efforts to Address Plastic Pollution & Marine Debris*, *supra* note 697, at slide 9.
[710] *Id*.
[711] *About Polar Programs*, NAT'L SCI. FOUND., https://www.nsf.gov/geo/opp/about.jsp (last visited Mar. 14, 2024).
[712] *NSF Efforts to Address Plastic Pollution & Marine Debris*, *supra* note 697, at slide 9.
[713] *About the Division of Ocean Sciences*, NAT'L SCI. FOUND., https://www.nsf.gov/geo/oce/about.jsp (last visited Mar. 14, 2024).
[714] *NSF Efforts to Address Plastic Pollution & Marine Debris*, *supra* note 697, at slide 9.

J. Department of Homeland Security (Navy during wartime)

1. Coast Guard

a. Marine Plastic Pollution Research and Control Act of 1987, amending the Act to Prevent Pollution from Ships, implementing Annex V of MARPOL 73/78

The Act to Prevent Pollution from Ships was amended by the Marine Plastic Pollution Research and Control Act of 1987 (MPPRCA),[715] which implemented the provisions of Annex V of the International Convention for the Prevention of Pollution from Ships of 1973, as modified by the Protocol of 1978 (MARPOL 73/78) relating to garbage and plastics.[716] Annex V applies to waste generated during a ship's operations and aims to reduce the amount of garbage—both plastics and other persistent wastes—that ships dump into the oceans.[717] Annex V includes a general ban on dumping plastics and synthetic materials, and specifically prohibits all ships from dumping plastics into the marine environment anywhere in the world.[718]

Under MPPRCA and its implementing regulations,[719] the discharge of plastics in any form, including synthetic ropes, fishing nets, garbage bags, and incinerator ashes from plastic products, is prohibited.[720] The regulations apply to all recreational, fishing, uninspected and inspected vessels, fixed and floating platforms, and foreign flag vessels on the navigable waters[721] and all other waters subject to the jurisdiction of the United States, out to and including the Exclusive Economic Zone (200 miles).[722]

The U.S. Coast Guard is responsible for the regulation and enforcement of these provisions, and may carry out investigations and enforcement actions as needed.[723] The regulations provide that there must be adequate waste reception facilities at U.S. ports; manned ships of certain sizes must display pollution prevention placards; certain ships must develop a waste management plan; and certain manned ships must maintain waste disposal records.[724] The U.S. Coast Guard promotes

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[715] 33 U.S.C. §§ 1901–1915.
[716] U.S. FEDERAL AGENCIES WITH OCEAN-RELATED PROGRAMS, YEAR OF THE OCEAN: DISCUSSION PAPERS A-29 (Mar. 1998), https://nepis.epa.gov/Exe/ZyPDF.cgi/200051DL.PDF?Dockey=200051DL.PDF.
[717] U.S. COAST GUARD, MARPOL 73/78 ANNEX V, https://www.dco.uscg.mil/Portals/9/DCO Documents/5p/CG-5PC/CG-CVC/Marpol/annexfive.pdf (last visited Mar. 14, 2024) [hereinafter U.S. COAST GUARD, ANNEX V].
[718] *Id.* Note, for other types of garbage, Annex V designates places where dumping is prohibited and sets conditions for dumping at sea.
[719] 33 C.F.R. § 151.51–79.
[720] *See* 33 U.S.C. § 1902(b)(3)(B); 33 C.F.R. § 151.67 ("No person on board any ship may discharge into the sea, or into the navigable waters of the United States, plastic or garbage mixed with plastic, including, but not limited to, synthetic ropes, synthetic fishing nets, and plastic garbage bags. All garbage containing plastics requiring disposal must be discharged ashore or incinerated."); 33 C.F.R. § 151.05 (defining plastics).
[721] 33 C.F.R. § 151.05.
[722] U.S. COAST GUARD, MARPOL ANNEX V, *supra* note 717; *see generally* 33 U.S.C. §§ 1901–1915; 33 C.F.R. § 151.51–79.
[723] *See generally* 33 U.S.C. §§ 1907–1908.
[724] *Id.*

compliance by boarding and inspecting vessels, and working with local port agencies to ensure there are facilities to receive garbage from vessels.[725] The U.S. Coast Guard also coordinates with the Environmental Protection Agency, National Marine Fisheries Service, National Park Service, and Ocean Conservancy in monitoring and measuring amounts of marine debris.[726]

How the Marine Plastic Pollution Research and Control Act may apply to Intervention 4, improve waste management through disposal, collection, and recycling improvements:
The Marine Plastic Pollution Research and Control Act requires that there be adequate waste management onboard vessels and reception facilities at U.S. ports. The full force of the law should be implemented to improve collection, recycling, and disposal of all plastic waste generated by vessels covered by the Act.

How the Marine Plastic Pollution Research and Control Act may apply to Intervention 6, minimize ocean disposal by increasing enforcement for at-sea disposal:
The U.S. Coast Guard is responsible for enforcement under the Marine Plastic Pollution Research and Control Act. The U.S. Coast Guard's current coordinated approach is largely preventative; however, inspections and enforcement actions should be carried out to ensure compliance.

How the Marine Plastic Pollution Research and Control Act may apply to Intervention 6, minimize ocean disposal by reducing at-sea abandonment or discard of fishing gear:
The Marine Plastic Pollution Research and Control Act prohibits the discharge of plastics in any form, including fishing gear, from vessels in navigable waters and all other waters subject to the jurisdiction of the U.S., out to and including the Excluding Economic Zone. The Act thus provides the opportunity to regulate plastic waste in general, both at-sea and within all navigable waters of the United States.

K. Consumer Product Safety Commission

1. Consumer Product Safety Improvement Act

Through the Consumer Product Safety Act (CPSA), Congress created the U.S. Consumer Product Safety Commission (CPS Commission), an independent federal regulatory agency charged with "protect[ing] the public against unreasonable risks of injuries and deaths associated with consumer products."[727] "Consumer products" define the jurisdictional scope of the CPS Commission but have

[725] JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., RS22145, ENVIRONMENTAL ACTIVITIES OF THE U.S. COAST GUARD 4 (Aug. 18, 2011).
[726] *Id*.
[727] 15 U.S.C. § 2051(a)(3).

been broadly defined and "generally cover thousands of products that are manufactured or used for consumer purposes, with the exception of those products that are carved out by statute."[728]

Under the CPSA, the CPS Commission is authorized to promulgate consumer product safety standards that are composed of either or both: (1) requirements expressed in terms of performance requirements; or (2) requirements that a consumer product be marked with or accompanied by clear and adequate warnings or instructions, or requirements respecting the form of warnings or instructions."[729] However, the CPS Commission is also directed under the CPSA to "rely upon voluntary consumer product safety standards rather than promulgate a consumer product safety standard . . . whenever compliance with such voluntary standards would eliminate or adequately reduce the risk of injury addressed and it is likely that there will be substantial compliance with voluntary standards."[730]

a. Prohibition of Children's Toys and Child Care Articles Containing Specified Phthalates

Ortho-phthalates, or "phthalates," are a family of chemical compounds used to soften vinyl plastic and are used in a variety of plastic products, ranging from personal care products, medication coatings, and tubing used for food processing.[731] The CSPA, subsequent amendments thereto, and implementing regulations address, in part, the concentration of phthalates in consumer products.

In 2008, the CPSA was amended via the Consumer Product Safety Improvement Act[732] to, in part, "reauthorize and modernize the [CPS Commission]." The 2008 amendments permanently prohibited "any person to manufacture for sale, offer for sale, distribute in commerce, or import into the United States any children's toy or child care article that contains concentrations of more than 0.1 percent of di-(2-ethylhexyl) phthalate (DEHP), dibutyl phthalate (DBP), or benzyl butyl phthalate (BBP)."[733] In 2017, the CPS Commission issued a final rule banning children's toys and child care articles containing more than 0.1 percent of five other phthalate chemicals: diisononyl phthalate (DNP); di-n-pentyl phthalate (DPENP); di-n-hexyl phthalate (DHEXP); dicyclohexyl phthalate (DCHP); and diisobutyl phthalate (DIBP).[734]

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[728] DAVID H. CARPENTER, CONG. RESEARCH SERV., R45174, THE CONSUMER PRODUCT SAFETY ACT: A LEGAL ANALYSIS 2 (2018).

[729] 15 U.S.C. § 2056(a).

[730] 15 U.S.C. § 2056(b); The CPS Commission states that it works in collaboration with groups like the American National Standards Institute, ASTM International, Canadian Standards Association, and others to establish voluntary standards, *see Voluntary Standards*, U.S. CONSUMER PRODUCT SAFETY COMM'N, https://www.cpsc.gov/Regulations-Laws--Standards/Voluntary-Standards#:~:text=Through%20collaboration%20with%20voluntary%20standard,best%20consumer%20product%20safety%20practices (last visited Mar. 14, 2024).

[731] Karen Feldscher, *Why phthalates should be restricted or banned from consumer products*, HAR. T.H. CHAN. SCH. PUB. HEALTH (Mar. 10, 2021), https://www.hsph.harvard.edu/news/features/the-big-3-why-phthalates-should-be-restricted-or-banned-from-consumer-products/.

[732] 15 U.S.C. § 2051.

[733] Consumer Product Safety Improvement Act, Pub. L. No. 110-314, tit. I, § 108, 122 Stat. 3036 (2008) (codified at 15 U.S.C. 2057c).

[734] 16 C.F.R. pt. 1307.

The 2008 CPSA Amendments and 2017 rule are discrete examples of federal authority to limit the chemical concentrations of some plastic products; here, the concentrations of phthalates in children's toys and childcare articles.

i. Unilateral Press Releases & Incentivizing Voluntary Recalls of Hazardous Consumer Products

The CPSA requires manufacturers, importers, distributors, and retailers subject to the CPSC's jurisdiction to "immediately" inform the CPS Commission whenever the manufacturer, importer, distributor, or retailer of a consumer product or product over which the CPS Commission has jurisdiction:

> obtains information which reasonably supports the conclusion that such product—
> (1) fails to comply with an applicable consumer product safety rule or with a voluntary consumer product safety standard upon which the Commission has relied under section 9 [15 U.S.C.— 2058];
> (2) fails to comply with any other rule, regulation, standard, or ban under this Act or any other Act enforced by the Commission;
> (3) contains a defect which could create a substantial product hazard described in subsection [15 U.S.C. § 2064](a)(2); or
> (4) creates unreasonable risk of serious injury or death.[735]

When a reporting obligation is triggered under CPSA, the subject firm (manufacturer or importer of a consumer product) must submit an "Initial Report" to the CPS Commission that: identifies and describes the substantial product hazard; names the identities and addresses of the manufacturer or importer and all known distributors and retailers of the product; the nature and extent of the possible defect, failure to comply, or the risk; nature and extent of the injury or risk of injury associated with the product; name and address of person informing the CPS Commission; and any information then available that will be later required under the "Full Report" (e.g., specific identifiers of products, such as retail prices, model numbers, serial numbers, date codes; manner in which the information about the defect, noncompliance or risk was obtained, etc.).[736]

Section 2064 reports can result in product recalls, which are most commonly conducted "'voluntarily' by companies in cooperation with the CPS Commission."[737] This can be done in one of three ways, through 1) the CPS Commission's preliminary determination process; 2) the CPS Commission's Fast Track Recall Program; or 3) CPS Commission notification to the subject firm that

[735] 15 U.S.C. § 2064(b).
[736] 16 C.F.R. § 1115.13(b)–(c).
[737] Eric A. Rubel et al., *CPSC Desk Reference: Section 15 of the Consumer Product Safety Act*, ARNOLD & PORTER 9 (Mar. 2023).

it plans to issue a "unilateral press release" to warn the public of the alleged hazardous product—seeking to encourage the subject firm to "voluntarily" issue a recall for the given consumer product.[738] If the subject firm is unable or unwilling to voluntarily issue a recall, the CPS Commission can issue a unilateral press release to warn the public of the hazard.[739]

In 2023, the CPS Commissioner stated that the CPS Commission "has, in the past, demonstrated a lack of will to use its full set of enforcement tools," including its unilateral warning authority.[740] From 2021 to 2023, however, the CPS Commission issued 25 unilateral press releases, or safety warnings.[741] While a representative sample of recent unilateral press releases have generally focused on immediate human health hazards (e.g., risk of fire, suffocation, drowning, ingestion, etc.), the CPS Commission's authority to warn nonetheless extends to issue unilateral press releases for products that, among other things, create "unreasonable risk[s] of serious injury." The CPS Commission can consider how this authority might apply to warning the public about specific plastic materials and their impacts on human health.

ii. Interagency Coordination to Fund Research on Human Health Impacts of Plastic and Plastic Products

CPSC also frequently collaborates with the Department of Defense, EPA, FDA, the National Institute for Occupational Safety and Health, National Science Foundation, National Library of Medicine/National Institute of Health, and National Institute of Standards and Technology to advance scientific literacy on human health impacts from plastic and plastic products. For example, CPSC has co-funded research reports with some of the above listed agencies that examine the human health impacts of consumer exposures to laser printed-emitted engineered nanoparticles.[742] CPSC staff also issue reports on their own accord that discuss plastic exposure risks to human health, such as the 2020 CPSC staff report examining concerns over human health impacts that might result from 3D printing and 3D printed consumer products.[743] CPSC can work independently and collaboratively with other federal agencies to advance the body of literature on human health impacts from plastics and plastic products.

How the Consumer Product Safety Act and Consumer Product Safety Improvement Act may be applied to Intervention 2, innovate material and product design through enforceable product standards for manufacturers:

[738] *Id*. at 9–10 (these press releases can be titled "Urgent Warnings" on the CPS Commission website).
[739] *See* 16 C.F.R. pt. 1101 (requiring the CPS Commission to provide subject firms with at least 15 days to comment on the accuracy of the information in the unilateral press release unless the Commission finds that public health and safety requires a lesser period of time).
[740] Statement of Commissioner Peter A. Feldman: CPSC Proves Once Again that Section 6(b) is not a Gag Rule, (Aug. 16, 2023) (available at https://www.cpsc.gov/s3fs-public/COPFStatementon6b.pdf?VersionId=tMMhMS1Kg2SYgy3bxwbV2C6hH76ghBYs).
[741] *Id*.
[742] Sandra V. Pirela et al., *Consumer exposures to laser printed-emitted engineered nanoparticles: A case study of life-cycle implications from nano-enabled products*, 9 NANOTOXICOLOGY 760 (2014).
[743] CONSUMER PRODUCT SAFETY COMM'N STAFF, SAFETY CONCERNS ASSOCIATED WITH 3D PRINTING AND 3D PRINTED CONSUMER PRODUCTS (May 6, 2020).

The CPS Commission is broadly authorized under the CPSA to "protect the public against unreasonable risks of injuries and deaths associated with consumer products." The 2008 Amendments to the CPSA permanently banned certain concentrations of three specific phthalates in children's toys and childcare articles. The CPS Commission promulgated a rule in 2017 banning concentrations of five additional phthalates. Plastic manufacturers who violate these provisions, among others, may be subject to civil or criminal penalties, which aligns with the goal of Intervention 2 to establish enforceable product standards for manufacturers. Additionally, the CPSA may be viewed as an authority that responds generally to Intervention 2 as a vehicle to indirectly target the development of viable plastic substitutes by banning certain chemical concentrations.

How the Consumer Product Safety Act and Consumer Product Safety Improvement Act may support the interventions through education and outreach activities:

The CPS Commission has existing authority to issue public safety warnings for various product hazards. In furtherance of the CPS Commission's charge to "protect the public against unreasonable risks of injuries and deaths associated with consumer products," the CPS Commission could engage in review of how plastic products may pose serious threats to public health and welfare and, to the extent applicable and lawful, use its CPSA section 6(b) authority to unilaterally warn/educate the public of such identified risks.

How the Consumer Product Safety Act and Consumer Product Safety Improvement Act may support the interventions through research and development activities:

The CPSC has, and continue to, fund and lead research efforts that examine human health risks from exposure to plastic and plastic products. The Commission can continue to coordinate with other federal agencies to leverage research funding capacity.

L. Department of Agriculture

1. Farm Bill

The "Farm Bill" refers to legislation typically passed once every four to five years that authorizes the farming and food related programs of the U.S. Department of Agriculture (USDA). Since 2002, each iteration of the Farm Bill has authorized the USDA's BioPreferred Program, which, as discussed below, is relevant to addressing plastic pollution.

a. BioPreferred Program

USDA's BioPreferred Program, authorized by the 2002 Farm Bill and expanded via the 2014 and 2018 Farm Bills, aims to accelerate the development of markets for biobased products.[744] These

[744] 7 U.S.C. § 8102.

biobased products are often promoted as alternatives to plastic products, such as eating utensils and packaging, and are generally made of "biological products, forestry materials, or renewable domestic agricultural materials."[745] However, as noted in the NASEM Report, biobased plastics may have similar characteristics as fossil carbon-based plastics, and as a result may require more study as an alternative to traditionally sourced plastic products:

> [Plastics] can be manufactured from biomass carbon feedstocks. These plastics are biobased, but they will have identical chemical structure as those manufactured using fossil carbon feedstocks and exhibit the same non-biodegradable, persistent characteristics. […] Biobased refers to the plastic feedstock and does not relate to how biodegradable the plastic is (Closed Loop Partners 2020, Law and Narayan 2022). Several, but not all, biobased plastics are biodegradable and industrially compostable at end of life.[746]

The BioPreferred Program supports the emerging biobased product markets in two ways. First, there is a mandatory procurement requirement for federal agencies to purchase certain biobased alternatives when feasible.[747] Subpart 23.4 of the Federal Acquisition Regulation requires federal agencies to give preference to biobased products when purchasing something that falls under any of the 139 categories of products that USDA has designated under the BioPreferred Program.[748] If the product falls under one of these categories, agencies must choose a product that contains a minimum level of biobased content as determined by USDA. The only exceptions to this procurement requirement are when the biobased versions of the product do not meet performance needs (which can occur when fewer than two suppliers are available for an item), the item is unreasonably priced, or regular delivery cannot be guaranteed.[749]

Second, the BioPreferred Program has established a voluntary labeling initiative for biobased products.[750] The Certified Biobased Product Label is a product-displayed label intended to inform consumers about biobased alternatives. Businesses apply to USDA for certification to display the label, and USDA tests manufacturers' claims concerning biobased content of their products with third-party certifiers.[751]

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[745] *Welcome to the BioPreferred Program Catalog*, U.S. DEP'T OF AGRIC., https://www.biopreferred.gov/BioPreferred/faces/catalog/Catalog.xhtml (last visited Mar. 14, 2023); *Bio-Based and Bio-Preferred Products*, U.S. GEN. SERVS. ADMIN., https://www.gsa.gov/climate-action-and-sustainability/buy-green-products-services-and-vehicles/buy-green-products/biobased-and-biopreferred-products (last visited Mar. 14, 2024).
[746] NASEM Report, *supra* note 5, at 33.
[747] 7 U.S.C. § 8102(a).
[748] 48 C.F.R. §§ 23.400–23.406.
[749] *Bio-Based and Bio-Preferred Products*, *supra* note 745.
[750] *What Is The Biopreferred Program?*, U.S. DEP'T. OF AGRIC, https://www.biopreferred.gov/BioPreferred/faces/pages/AboutBioPreferred.xhtml (last visited Mar. 14, 2024).
[751] 7 U.S.C. § 8102(b).

How the USDA's BioPreferred Program may be applied to Intervention 2, innovate material and product design through standards for labeling and marketing:
The 2002 Farm Bill created a voluntary labeling program to promote biobased products, which has been reauthorized in every subsequent Farm Bill. As part of the USDA's broader BioPreferred Program, the labeling program allows businesses that make products with a minimum content of biobased material to display the USDA Certified Biobased Product label. Businesses apply to USDA for certification to display the label, and USDA tests manufacturers' claims concerning biobased content of their products with third-party certifiers.

How the USDA's BioPreferred Program may be applied to Intervention 3, decrease waste generation through mandatory procurement rules favoring reusable products:
The 2002 Farm Bill created a mandatory procurement rule for biobased products, which has been reauthorized and expanded in every subsequent Farm Bill. Operated by the USDA's BioPreferred Program, the procurement rule requires that federal agencies give preference to biobased alternatives when purchasing products within any of the 139 categories designated under the BioPreferred Program. This serves an additional benefit by helping to displace the need for materials made of petroleum-based chemicals.

M. Department of Energy

1. Department of Energy Organization Act; Energy Policy Act of 2005; and Energy Research and Innovation Act of 2018

Under section 209 of the Department of Energy Organization Act (DEOA), the Director of the Office of Science—formerly the Office of Energy Research—is to advise the Department of Energy (DOE) Secretary "with respect to grants and other forms of financial assistance required for the effective short- and long-term basic and applied research activities of the [DOE]."[752] The mission of the Office of Science is "the delivery of scientific discoveries, capabilities, and major scientific tools to transform the understanding of nature and to advance the energy, economic, and national security of the [United States]."[753]

a. Energy Frontier Research Centers

As part of the activities that DEOA section 209 authorizes, as established through the Energy Policy Act of 2005 and Energy Research and Innovation Act of 2018, the DOE Director must "carry out a program to provide awards, on a competitive, merit-reviewed basis, to multi-institutional collaborations or other appropriate entities to conduct fundamental and use-inspired energy research to accelerative scientific breakthroughs."[754] These programs are referred to as "Energy

[752] 42 U.S.C. § 7139(b)(5).
[753] 42 U.S.C. § 7139(c).
[754] 42 U.S.C. § 18641(c).

Frontier Research Centers" and are administered through the DOE Office of Science's Basic Energy Sciences (BES) program. The BES program funds research at more than 160 research institutions and provides a variety of financial assistance opportunities to fund this work.[755] One such example is the award that helped establish the University of Delaware's Center for Plastics Innovation.

The Center for Plastics Innovation's mission is to "develop catalytic and functionalization approaches and fundamental tools applicable to the upcycling of polymer plastics waste, with a strategic focus on enabling mixed-stream transformations from varied material form factors."[756] Because the Center for Plastics Innovation receives federal funding from DOE and works to research innovative polymer upcycling strategies, the Center for Plastics Innovation serves as an example of how the DOE can leverage its statutory authority to provide financial assistance for "accelerative scientific breakthroughs" to improve plastic recycling techniques.

How the Department of Energy Organization Act and Energy Policy Acts of 2005 and 2018 may be applied to Intervention 4, improve waste management through disposal, collection, and recycling improvements:
DOE can continue to use its existing authority under the Department of Energy Organization Act and Energy Policy Acts of 2005 and 2018 to improve waste management (intervention 4) through disposal, collection, and recycling improvements. DOE can provide financial assistance for short- and long-term basic and applied research activities of the agency, such as the Energy Frontier Research Centers. One such example is the University of Delaware's Center for Plastics Innovation, which currently works to improve plastic polymer waste upcycling strategies. This DOE-funded initiative aligns with interventions to improve plastic recycling.

2. Energy Independence and Security Act of 2007 and Energy Research and Innovation Act of 2018

The Energy Independence and Security Act of 2007 was a general energy policy law that primarily made updates to fuel economy standards, the Renewable Fuels Standard (RFS), and energy efficiency standards in equipment and appliances.[757] However, the Act also authorized the Department of Energy (DOE) to research and develop "advanced technologies to improve the energy efficiency, environmental performance, and process efficiency of energy-intensive and waste-intensive industries."[758] The DOE has used this authorization to research potential energy efficiency improvements in the processing of plastic waste.

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[755] *Basic Energy Sciences (BES)*, U.S. DEP'T OF ENERGY, OFF. OF SCIS., https://science.osti.gov/bes (last visited Mar. 14, 2024); *see also* U.S. Dep't of Energy, Energy Frontier Research Centers Funding Opportunity Number: DE-FOA-0002204 (Nov. 13, 2019) (available at https://science.osti.gov/-/media/grants/pdf/foas/2020/SC_FOA_0002204.pdf).

[756] *About the Center for Plastics Innovation*, CTR. FOR PLASTICS INNOVATION, https://cpi.udel.edu/about-the-center-for-plastics-innovation/ (last visited Mar. 14, 2024).

[757] FRED SISSINE, CONG. RESEARCH SERV., RL34294, ENERGY INDEPENDENCE AND SECURITY ACT OF 2007: A SUMMARY OF MAJOR PROVISIONS 1 (Feb. 22, 2008).

[758] 42 U.S.C. § 16191(a)(2)(c).

a. Strategy for Plastics Innovation

Through this energy efficiency program authorization, the Department of Energy (DOE) launched a "Plastics Innovation Challenge" in 2019 to "make domestic processing of plastic waste more economically viable and energy-efficient, develop new and improved plastic materials lacking the end-of-life concerns as incumbent materials, and ultimately reduce plastic waste accumulation."[759] More recently, the Plastics Innovation Challenge has evolved into the "Strategy for Plastics Innovation" (SPI), which "spans the full research, development, and deployment spectrum to address key challenges that limit plastic recycling."[760] The energy-consumptive nature of the plastics manufacturing industry gave rise to these initiatives and programs.

The legal authority for these programs derives, in part, from 42 U.S.C. § 16191, enacted through the Energy Act of 2020. The DOE Secretary is authorized to conduct programs of energy efficiency research, development, demonstration, and commercial application for "advanced technologies to improve the energy efficiency, environmental performance, and process efficiency of energy-intensive industries."

The SPI is a DOE-wide coordinated research and development strategy between the Office of Energy Efficiency and Renewable Energy (EERE), Office of Science, Advanced Research Projects Agency–Energy, and Office of Fossil Energy and Carbon Management. The effort is coordinated by EERE's Bioenergy Technologies Office and Advanced Materials and Manufacturing Technologies Office. DOE also is coordinating plastic research activities within its network of national laboratories, academia, and industry.

One of four enumerated strategic goals announced for the SPI is to "design new and renewable plastics and bioplastics that have the properties of today's plastic, are easily upcycled, and can be manufactured at scale domestically" by 2030.[761] According to the SPI, "a lack of robust chemical and biological mechanisms limits the deconstruction of existing plastics," which is "further complicated by the need for more robust processes that can convert diverse and contaminated plastic waste streams into useful chemical intermediates that can be upcycled into high-value products."[762] The SPI focuses on three critical areas of research:

1. Thermal, chemical, and biological deconstruction and upgrading of plastics;
2. Enhancements to traditional mechanical recycling and sorting; and
3. New, application-driven plastics and materials that are easily recyclable or degradable by design.[763]

The objectives/metrics of the SPI are to:

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[759] U.S. DEP'T OF ENERGY, STRATEGY FOR PLASTICS INNOVATION REPORT V (Jan. 2023), https://www.energy.gov/sites/default/files/2023-01/DOE-strat-for-plastics-innova_1-19-23.pdf?ref=mackenziemorehead.com.
[760] *Id*. at 7.
[761] *Id*.
[762] *Id*. at V.
[763] *Id*. at 22–24.

> develop technologies to address end-of-life fate for >90% of plastic materials; provide ≥50% energy savings relative to virgin material production; achieve ≥75% carbon utilization from waste plastics to encourage material-efficient processes; design recycling strategies that mitigate ≥50% GHG emissions relative to virgin resin or plastic intermediate production; and develop recyclable-by-design plastic solutions and recycling processes that are cost-competitive with incumbent plastic materials and processes.[764]

Notably, the SPI is also guided by environmental justice and equity goals. A primary objective of the SPI is to reduce or eliminate health disparities resulting from plastic design and production research and development.[765] Another environmental justice and equity goal of the SPI is that "benefits from improved and new plastic production should be received by disadvantaged communities, particularly those most impacted by current plastic life cycles."[766]

The SPI encompasses a variety of consortia and centers to help effectuate its strategic vision. One example consortium relevant to improving plastic material design is the Bio-Optimized Technologies to keep Thermoplastics out of Landfills and the Environment (BOTTLE): a DOE "multi-organization consortium focused on . . . redesigning tomorrow's plastics to be recyclable by design."[767] BOTTLE is working to "build a library of millions of accessible bio/waste plastics-derived monomers, and then us[e] high-throughput machine-learning methods to predict novel material formulations of [recyclable-by-design] materials based on predicted performance."[768]

Though the current deadline to achieve the SPI "vision" is 2030, DOE has the statutory authority—provided the agency receives the necessary budget allocations—to continue to fund and develop energy efficiency programs to spur plastic material design innovation and establish public-private partnerships to achieve this goal.

b. Energy Research and Innovation Act of 2018

The legal authority for the SPI programs is also supported by the Energy Research and Innovation Act of 2018, through which Congress called for the support of the acceleration of clean energy innovation through DOE's existing research and development programs.[769] The DOE Secretary is also directed to "use the capabilities of the Department to identify strategic opportunities for collaborative research, development, demonstration, and commercial application of innovative

[764] *Id*. at 7.
[765] *Id*. at 5.
[766] *Id*.
[767] *SPI: Consortia and Centers*, U.S. DEP'T OF ENERGY, https://www.energy.gov/strategy-for-plastics-innovation/spi-consortia-and-centers (last visited Mar. 14, 2024).
[768] *Redesign and Modeling*, BOTTLE, https://www.bottle.org/research/redesign-modeling (last visited Mar. 14, 2024).
[769] 42 U.S.C. § 18611(2)(A).

science and technologies."[770] The SPI supports the goal of energy innovation, as the initiative "seeks to develop technologies that enable a dramatic reduction in plastic waste and position the United States as the world leader in advanced recycling and up cycling processes."[771]

The SPI also bolsters the argument that existing authority exists for the DOE Secretary to engage in cross-cutting research and development within the agency. As such, "DOE will leverage decades of research in key areas such as biopolymer deconstruction, catalysis science, genomic science, separation science, genomic science, separation science, materials science, techno-economic and life cycle analysis, and biosystems design" through the SPI.[772]

How the Strategy for Plastics Innovation's may apply to Intervention 2, innovate material and product design through voluntary commitments and collaborations:

The "Strategy for Plastics Innovation" (SPI) is an existing voluntary partnership among DOE and consortia and centers that "spans the full research, development, and deployment spectrum to address key challenges that limit plastic recycling." One of four enumerated strategic goals announced for the SPI is to "design new and renewable plastics and bioplastics that have the properties of today's plastic, are easily upcycled, and can be manufactured at scale domestically" by 2030.

How the Strategy for Plastics Innovation's may apply to Intervention 3, decrease waste generation through reusable and refillable systems:

DOE research—for example, which is produced by the consortia and centers that together compose "Strategy for Plastics Innovation" (SPI)—has and can continue to serve as an agent of intervention area 3 generally. Research that builds the body of literature on the plastic circular economy may have the effect of decreasing waste generation.

How the Strategy for Plastics Innovation may apply to Intervention 4, improve waste management through disposal, collection, and recycling improvements:

As can be seen in the SPI goals, DOE has existing authority to engage in cross-cutting research and development within the agency. DOE's statutory support to accelerate energy innovation, particular within the context of technologies that would enable improved upcycling processes, can conceivably help to improve plastic waste management.

How the Strategy for Plastics Innovation may support the interventions through research and development activities:

[770] 42 U.S.C. § 18631(a).
[771] U.S. DEP'T OF ENERGY, STRATEGY FOR PLASTICS INNOVATION, *supra* note 759, at 4.
[772] *Id*. at 7.

The Strategy for Plastics Innovation is a federal effort that "spans the full research, development, and deployment spectrum to address key challenges that limit plastic recycling."

3. Federal Grant and Cooperative Agreement Act

Consonant with the above listed authorities is DOE's general grant awarding authority. One example of this authority can be seen in DOE's Federal Grant and Cooperative Agreement Act implementing regulations, which establish the agency's procedures and policies for the awarding of DOE grants and cooperative agreements.[773] This authority has been and can continue to be used to fund a variety of plastics material redesign research and development efforts, such as the DOE's recent $13.4 million investment in seven research and development projects that will, in part, "design new plastics that are more recyclable and biodegradable."[774]

How the DOE Federal Grant and Cooperative Agreement Act may support the interventions through research and development activities:
DOE's general grant awarding authority may be leveraged to fund a variety of plastics material research and development efforts, such as projects that improve material recyclability.

N. Department of Health and Human Services

1. Food and Drug Administration

a. Food, Drug, and Cosmetic Act

The Food, Drug, and Cosmetic Act (FD&C) authorizes the Food and Drug Administration (FDA) to, among other responsibilities, ensure that no packaging material adulterates foods and to conduct pre-market reviews of new food-contact materials. In addition to ensuring the safety of packaging material with regard to food-contact use, the FDA also reviews and regulates packaging materials to ensure compliance with NEPA, frequently focusing on the packaging material's impact on recycling.[775]

i. Improving Post-market Reviews of Food Contact Substances

Pre-market Review

[773] 10 C.F.R. pt. 600.
[774] *DOE Invests $13.4 Million to Combat Plastic Waste, Reduce Plastic Industry Emissions*, U.S. DEP'T OF ENERGY, https://www.energy.gov/articles/doe-invests-134-million-combat-plastic-waste-reduce-plastic-industry-emissions (last visited Mar. 14, 2024).
[775] Keller & Heckman LLP's Packaging Practice Group, *Packing and Environmental Legislation in the United States: An Overview* (2002), https://www.packaginglaw.com/special-focus/packaging-and-environmental-legislation-united-states-overview.

Among other products, the FD&C regulates the safety of "food additives," which are defined as:

> any substance[s] the use of which results or may reasonably be expected to result, directly, or indirectly, in its becoming of a component or otherwise affecting the characteristics of any food . . . if such substance is not generally recognized . . . to be safe under the conditions of its intended use.[776]

Unless they meet specific exemptions, food additives—both direct and indirect—must obtain pre-market review and approval from FDA.[777] Pursuant to this authority, the FDA has promulgated regulations governing the use of food additives. Manufacturers of ingredients that are added directly into food (i.e., direct food additives) and substances that come into contact with food (i.e., indirect food additives) must comply with these regulations.

Certain "food contact substances" (FCS) are considered indirect food additives. Under the FD&C, a FCS is "any substance intended for use as a component of materials used in manufacturing, packing, packaging, transporting, or holding food if such use is not intended to have any technical effect in such food."[778]

Compliance with FDA regulations governing FCS depends on the materials used in, and including the component parts of, the FCS.[779] For example, regarding the use of polymers as basic components of single and repeated-use FCS, the FDA has promulgated regulations permitting the use of semirigid and rigid acrylic and modified acrylic plastics in contact with food, under prescribed conditions.[780] Similarly, the FDA has promulgated regulations regarding substances to be used to control the growth of microorganisms on food-contact articles and provides standards for certain additives.[781] FDA maintains a database of all approved FCS that "contains information on the substance identity and listed FDA regulations for the specific intended uses and use conditions authorized."[782]

Manufacturers of new FCS material in food packaging can petition the FDA through the Food Contact Notification Program (FCN) to register such new FCS material.[783] Manufacturers of FCS must furnish information to FDA regarding the chemical identities of the FCS and supporting information that the FCS is safe for its intended use. FDA will determine whether the company's submission is complete and then determine whether the company's safety assertion is supported. An FDA-approved FCN "is only effective for the manufacturer or supplier identified in the notification."[784]

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[776] 21 U.S.C. § 321(s).
[777] 21 U.S.C. § 348.
[778] 21 U.S.C. § 348(h)(6).
[779] PFAS Deskbook, *supra* note 30, at 51.
[780] 21 C.F.R. § 177.1010.
[781] 21 C.F.R. § 178.
[782] *Inventory of Food Contact Substances Listed in 21 CFR*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/packaging-food-contact-substances-fcs/inventory-food-contact-substances-listed-21-cfr (last visited Mar. 14, 2024).
[783] PFAS Deskbook, *supra* note 30, at 51.
[784] *Inventory of Effective Food Contact Substance (FCS) Notifications*, U.S. FOOD & DRUG ADMIN., https://www.cfsanappsexternal.fda.gov/scripts/fdcc/index.cfm?set=FCN (last visited Mar. 14, 2024).

FDA maintains a FCN database that lists all "effective premarket notifications for [FCS] that have been demonstrated to be safe for their intended use."[785]

Materials may be exempt from the aforementioned regulatory structure that requires premarket review and approval if they are "generally recognized as safe" (GRAS), satisfy the "functional barrier doctrine" under the "no migration" exclusion (as formalized through the Threshold of Regulation Rule (TOR)), or are otherwise exempted.[786]

First, a substance may be GRAS

> either through scientific procedure or, for a substance used in food before 1958, through experience based on common use in food under 21 C.F.R. § 170.30(b), [and] general recognition of safety through scientific procedures requires the same quantity and quality of scientific evidence as is required to obtain approval of the substance as a food additive.[787]

In 2016, the FDA "formalized a notification procedure" through which "any person may notify [the agency] of a conclusion that a substance is GRAS under the conditions of its intended use."[788] The notification procedure is voluntary, meaning "a manufacturer may bring a substance to market if it meets the GRAS requirements whether or not it notifies FDA;" however, FDA "strongly encourages" this procedure.[1]

Second, a material may be exempt from FCN regulatory structure if it meets the "functional barrier doctrine" that articulates the "no migration" exception. This exception applies to those substances that are part of food packaging but never become part of food itself.[789] This exception has been formalized through the Threshold of Regulation (TOR) Rule, which FDA describes as "a process for

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[785] *Id*.

[786] PFAS Deskbook, *supra* note 30, at 52 (explaining that the notification procedure is voluntary, meaning "a manufacturer may bring a substance to market if it meets the GRAS requirements whether or not it notifies FDA"); *About the GRAS Notification Program*, U.S. FOOD & DRUG ADMIN. (Oct. 2016), https://www.fda.gov/food/generally-recognized-safe-gras/about-gras-notification-program#:~:text=FDA%20strongly%20encourages%20any%20person,FDA%20oversight%20of%20GRAS%20conclusions (explaining that FDA "strongly encourages" the GRAS notification program); U.S. GOV'T ACCOUNTABILITY OFF., GAO-23-104434, FDA OVERSIGHT OF SUBSTANCES USED IN MANUFACTURING, PACKAGING, AND TRANSPORTING FOOD COULD BE STRENGTHENED 5–8 (2022) (explaining that substances may be exempt under FCN petition process or if the substance is on the prior sanctioned substance list).

[787] *Generally Recognized as Safe (GRAS)*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/food-ingredients-packaging/generally-recognized-safe-gras (last visited Mar. 14, 2024) (citing sections 201(s) and 409 of the FD&C).

[788] 81 Fed. Reg. 54,960 (Aug. 17, 2016) (explaining in the rule summary that "the clarified criteria for GRAS status should help stakeholders draw more informed conclusions about whether the intended conditions of use of a substance in food for humans or animals complies with the FD&C Act, and the notification procedure will enable stakeholders to be aware of whether we have questioned the basis of a conclusion of GRAS status").

[789] PFAS Deskbook, *supra* note 30, at 52.

determining when the likelihood or extent of migration to food of a substance used in a food-contact article is so trivial as not to require regulation of the substance as a food additive."[790] A company may request that FDA exempt certain FCS from regulation through the TOR if it can also show that the substance presents no other health or safety concerns because the substance's intended use "has been shown or may be expected to result in dietary concentrations at or below 0.5 parts per billion."[791] Currently, most companies use the FCN program as a means of market entry.[792]

The above discussion reviews pre-market processes that can apply before a substance is brought to market; however, a brief review of FDA's discretionary post-market review processes is relevant to this discussion.

Post-market Review

Borrowing from relatively nascent history beginning in the 1960s, several manufacturers of PFAS "frequently used the FCN program to obtain approval for their PFAS formulations."[793]
Over the decades as the hazards of PFAS became more well-understood, FDA eventually instituted a voluntary phase-out program with PFAS manufacturers based on a post-market review. Post-market reviews are conducted by FDA on "its own initiative . . . at the staff's discretion and as resources are available."[794]

Notably, however, several PFAS remain on the FCN Program database and PFAS may "still be introduced into the food system through the GRAS or no-migration exemptions."[795] The GRAS [voluntary] notice inventory contains no entries for PFAS chemicals."[796] Manufacturers and companies whose PFAS formulations meet the GRAS requirements can still bring their formulations to market unilaterally without submitting notification to FDA.[797]

Against this backdrop, the Government Accountability Office issued a report in 2022, titled *Food Safety: FDA Oversight of Substances Used in Manufacturing, Packaging, and Transporting Food Could be Strengthened*, that examined FDA's current premarket authorizations and made two specific recommendations to FDA based on Government Accountability Office (GAO)-identified limitations "that impede a risk-informed, post-market review process for food contact substances."[798]

First, GAO determined that FDA "does not have specific legal authority to compel companies to provide information and data on substances' safety and extent of use" and that the FDA could

[790] 60 Fed. Reg. 26,851, 36,582 (July 17, 1995).
[791] 21 C.F.R. § 170.39(2)(i).
[792] GAO-23-104434, *supra* note 786, at 8.
[793] PFAS Deskbook, *supra* note 30, at 53.
[794] GAO-23-104434, *supra* note 786, at 14.
[795] PFAS Deskbook, *supra* note 30, at 53.
[796] *Id*. at 53.
[797] *Id*.
[798] GAO-23-104434, *supra* note 786.

"request specific authority [from Congress] to compel companies to provide [such] information."[799] Second, GAO found that "FDA's system cannot readily identify all substances that, according to their last review dates, may warrant additional review because new safety information may have emerged."[800]

Notwithstanding GAO's recommendation that FDA request additional authority from Congress to compel disclosure of information on FCS's safety and use, FDA can improve its post-market review process—informed by the recent PFAS phaseouts.[801]

GAO recommends that FDA can "track[] the date of the last review for all FCS in a way that allows FDA to readily identify substances that may warrant a post[-]market review."[802] Doing so "could help support FDA's strategic plan[—for its food program that seeks to improve data-driven, post-market surveillance of substances added to the food supply—] and help [FDA] make risk-informed decisions on where to focus its resources for conducting future [post-market] reviews."[803]

This recommendation may be relevant for FDA's review of several plastic polymers that are FCN and already on the market, such as polyethylene and polypropylene, to ensure that post-market reviews account for any updated safety information. The Department of Health and Human Services—under which FDA is housed—indicated, as a result of this GAO report, that it agreed with this recommendation and "has begun and will continue to work on implementing this recommendation."[804]

How FDA levers may be applied to Intervention 2, innovate material and product design, enforceable product standards for manufacturers:
The FDA has levers available to establish enforceable product standards for plastic manufacturers via regulation, such as the food additives regulation, which governs the use of polymers in substances used in food-contact products.

How FDA levers may support the interventions through information and data collection activities:
As first recommended by the Government Accountability Office, the FDA can improve its post-market review process by tracking the date of the last review for all FCS that are already on the

[799] *Id*.
[800] *Id*.
[801] For example, the FDA recently announced the fulfillment of a voluntary industry commitment to phaseout grease-proofing materials containing PFAS in food contact substances in the United States. Press Release, U.S. Food & Drug Admin., FDA, Industry Actions End Sales of PFAS Used in US Food Packaging (Feb. 28, 2024) (available at https://www.fda.gov/news-events/press-announcements/fda-industry-actions-end-sales-pfas-used-us-food-packaging).
[802] GAO-23-104434, *supra* note 786, at 20.
[803] *Id*.
[804] *Id*. at 22.

market to more readily identify which substances should be prioritized for post-market review. Doing so may help the FDA determine which substances should be prioritized based on new safety information that has emerged since the substance first entered the market.

ii. Recycled Plastics for Food Packaging Program

Though not required by law or regulation, the FDA has instituted a voluntary program with recyclers of plastics intended for food-contact uses to assess the safety and effectiveness of the proposed recycling process(es) in food-contact application.[805] Supplemental to the pre-market review required for FCS that are food additives under the FD&C,[806] the FDA invites manufacturers of post-consumer recycled plastic (PCR) for FCS to submit information on their recycling processes "to ensure that the recycled material is suitable for use in food-contact applications."[807]

Information FDA will review on a case-by-case basis through this process includes:

- a complete description of the recycling process;
- a description of any steps that are taken to ensure that the recyclable plastic is not contaminated either before collection for recycling or during the recycling process;
- the results of any tests performed to show that the recycling process remove possible incidental contaminants; and
- a description of the proposed conditions of use of the plastic.[808]

FDA will use the submitted information to form its scientific opinion and transmit an advisory opinion letter to the manufacturer based on its findings.[809] This process allows for the regulator and the regulated community to communicate early in the FCN process. More generally, this type of voluntary agreement may help to accomplish or encourage the safety of recycling processes used for PCR in food-contact substances.

[805] U.S. FOOD & DRUG ADMIN., OMB CTRL. NO. 0910-0495, USE OF RECYCLED PLASTICS IN FOOD PACKAGING (CHEMISTRY CONSIDERATIONS): GUIDANCE FOR INDUSTRY (2021).

[806] *See Understanding How the FDA Regulates Substances that Come into Contact with Food*, U.S. FOOD & DRUG ADMIN, https://www.fda.gov/food/food-packaging-other-substances-come-contact-food-information-consumers/understanding-how-fda-regulates-substances-come-contact-food (last visited Mar. 14, 2024) (explaining that premarket review for food contact substances (food contact notification process) involves a "rigorous scientific safety assessment of information a manufacturer or sponsor submits to the FDA, and [FDA] considers other relevant information available [omitted], to ensure that the intended use of a food contact substance is safe).

[807] *Food Packaging & Other Substances that Come in Contact with Food Information for Consumers*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/food-ingredients-packaging/food-packaging-other-substances-come-contact-food-information-consumers (last visited Mar. 14, 2024).

[808] *Recycled Plastics in Food Packaging*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/packaging-food-contact-substances-fcs/recycled-plastics-food-packaging (last visited Mar. 14, 2024).

[809] *Id*.

How FDA's food packaging program may be applied to Intervention 2, innovate material and product design through voluntary commitments and collaborations:
By permitting manufacturers of post-consumer recycled plastic (PCR) to submit relevant recycling process information to the agency outside of the pre-market review process and offering feedback, the FDA may help PCR recyclers pursue safe and effective plastic recycling processes at a sustained pace. This process may help to improve plastic material design by providing manufacturers the opportunity to receive informal agency feedback before the formal regulatory processes commence.

b. Microbead Free Waters Act

The Microbead Free Waters Act prohibits the manufacture of certain cosmetics containing plastic microbeads. It does not, however, prohibit the production of plastic microbeads.

The Microbead Free Waters Act (MFWA)[810] was enacted in 2015, amending the Food Drug and Cosmetic Act. The MFWA received both Congressional and industry support due to the rise in state laws banning products containing plastic microbeads.

The MFWA specifically directs the Food and Drug Administration (FDA) to prohibit the manufacture and distribution of rinse-off cosmetics that contain plastic microbeads. The law defines plastic microbead as "any solid plastic particle that is less than five millimeters in size and is intended to be used to exfoliate or cleanse the human body or any part thereof."[811] Such particles are considered primary microplastics, which are made for a specific purpose.[812] The MFWA applies to rinse-off cosmetics, such as facial cleansers, scrubs, or other bath products, and includes non-prescription or over-the-counter drugs, such as toothpastes.[813] The law does not include microbeads found in deodorants, lotions, or other cosmetic products that are not "rinsed off," nor does it include non-cosmetic microbeads.[814]

The MFWA is a narrowly defined statute that does not apply to industrial microbeads, secondary microplastics that are broken down from larger pieces of plastic, or preproduction plastic pellets. Congress may eventually expand the statute's scope, however, to ban microbeads in more consumer products.[815]

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[810] Microbead Free Waters Act, Pub. L. No. 114-114, 129 Stat. 3129 (2015) (amending 21 U.S.C. § 331).
[811] Pub. L. No. 114-114, at §§ 2(a), ddd(2)(A).
[812] *Microplastics*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://marinedebris.noaa.gov/what-marine-debris/microplastics (last visited Mar. 14, 2024).
[813] *Id*.; Sarah Kettenmann, *Nationwide Ban on Plastic Microbeads in Cosmetics*, 31 NAT. RES. & ENV'T 1 (Summer 2016).
[814] Kettenmann, *supra* note 813, at 1 (explaining that non-cosmetic microbeads are used in a wide range of applications, from cleaning products and medical applications to oil and gas exploration).
[815] *Id*.

How the Microbead Free Waters Act may apply to Intervention 1, reduce plastic production and pollution from production through restriction of certain problematic and unnecessary primary polymers, chemicals of concern, and pollution:
The Microbead Free Waters Act directly bans cosmetic products containing plastic microbeads and is an example of Congress regulating production of certain plastic product components to reduce pollution of certain plastics.

How the Microbead Free Waters Act may apply to Intervention 2, innovate material and product design through enforceable product standards:
The Microbead Free Waters Act directly bans cosmetic products containing plastic microbeads, creating an enforceable product standard for certain cosmetics. It does not, however, prohibit the production of plastic microbeads.

How the Microbead Free Waters Act may apply to Intervention 3, decrease waste generation through plastic product bans:
The Microbead Free Waters Act directly bans cosmetic products containing plastic microbeads, decreasing the overall waste generation from microbeads.

2. Agency for Toxic Substances and Disease Registry

a. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("Superfund")

i. Literature and Research Inventories

Through section 104 of CERCLA, Congress established a national public health agency, the Agency for Toxic Substances and Disease Registry (ATSDR), which is housed within the U.S. Department of Health and Human Services. The agency's responsibilities include "responding to environmental health emergencies; investigating emerging environmental health threats; conducting research on the health impacts of hazardous waste sites; and building capabilities of and providing actionable guidance to state and local health partners."[816]

ATSDR is tasked under CERCLA to collaborate with EPA and the Centers for Disease Control and Prevention (CDC), among other state and federal partners, to "establish and maintain inventory of literature, research, and studies on the health effects of toxic substances."[817]

[816] 41 U.S.C. § 9604(i); *Agency for Toxic Substances and Disease Registry (ATSDR)*, AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, https://www.atsdr.cdc.gov/index.html (last visited Mar. 14, 2024).
[817] 41 U.S.C. § 9604(i)(1)(B).

Consonant with this congressional directive, ATSDR established a working group with the CDC's National Center for Environmental Health in 2020 to "define human health risks regarding exposure to and toxicity from microplastics."[818] The vision and strategies of this working group are to: "1) develop the science and resources to define and prioritize the health risks [of microplastic exposure]; 2) create constructive partnerships to broaden outreach; and 3) energize communities and institutions to develop initiatives to stop harmful microplastic exposures in our environment."[819]

ATSDR reported that "because [microplastics] and [nanoplastics] are emerging pollutants, it was necessary to examine the scope of [microplastic] and [nanoplastic] contamination, as well as their potential short- and long-term effects on public health."[820] One result of this interagency workgroup has been a broad scale "literature review to define human health risks from [microplastics] and [nanoplastics.]."[821] The early efforts of this working group resulted in review of

> published literature to identify microplastic and nanoplastic studies that quantified exposure via the ingestion, inhalation, and subcutaneous absorption (not dermal) exposure pathways; identified translocation, internal dose, and associations with health effects and markers related to exposures to specific sizes and types of plastics. [The working group] identified data gaps in relating exposure data to health effects and biomarkers, most notably the lack of characterization of plastic particles and fibers smaller than 10 μm in most media.[822]

As of the date of this report, ATSDR plans to share the full results of this research at a symposium with academic and scientific institutions to "encourage scientists to focus on the necessary data gaps" as identified in the working group's literature review.[823]

ATSDR and other federal and state partners, such as the EPA, can continue to work collaboratively to conduct necessary research reviews to address pollutants of emerging concern, such as microplastics and nanoplastics, through the authority conferred under CERCLA.

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[818] AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, ATSDR ANNUAL REPORT 2020 33 (2020).
[819] Yulia Carroll et al., NCEH/ATSDR Microplastic Working Group: Identifying and Addressing Data Needs to Evaluated Human Exposures to Microplastics (MP), Poster (Aug. 2020).
[820] ATSDR ANNUAL REPORT 2020, *supra* note 818, at 33.
[821] *Id*.
[822] Gregory M. Zarus et al., *A review of data for quantifying human exposures to micro and nanoplastics and potential health risks*, 756 SCI. OF THE TOTAL ENVT. 144010 (Feb. 20, 2021).
[823] ATSDR ANNUAL REPORT 2020, *supra* note 818, at 33.

How CERCLA may support the interventions through information and data collection:
The Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, EPA and other state and federal entities can work collaboratively under ATSDR's enabling authority to "establish and maintain inventory of literature, research, and studies on the health effects of toxic substances." This authority has been and may continue to be used to research exposure risks to human health from microplastic and communicate the findings broadly.

3. Centers for Disease Control and Prevention

a. Public Health Service Act of 1944

Unlike most federal agencies, the CDC does not have a single enabling law providing its statutory authorities.[824] The Public Health Service Act of 1944 (PHSA) provides most of the Center's authorities while several other authorities stem from program-specific legislation.[825] For example, the authorities authorizing the CDC to engage in general research and investigation,[826] work in international cooperation,[827] host health conferences and publish health education information,[828] facilitate federal-state cooperation in public health matters,[829] and issue grants for preventative health services[830] all come from the PHSA. Meanwhile, other CDC authorities such as the National Instituted for Occupation Safety[831] and Health and the Agency for Toxic Substances and Disease Registry[832] are authorized under program-specific legislation.[833]

As discussed above, the CDC's National Center for Environmental Health conducts laboratory research to improve the rapid and accurate detection of chemical threats and selected toxins. The

[824] KAVYA SEKAR, CONG. RESEARCH SERV., IF12241, THE CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC) 1 (Mar. 27, 2023).
[825] *Id*.
[826] 42 U.S.C. § 241(a) ("The Secretary shall conduct in the Service, and encourage, cooperate with, and render assistance to other appropriate public authorities, scientific institutions, and scientists in the conduct of, and promote the coordination of, research, investigations, experiments, demonstrations, and studies relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man, including water purification, sewage treatment, and pollution of lakes and streams.").
[827] 42 U.S.C. § 242l ("The Secretary may participate with other countries in cooperative endeavors in—(1) biomedical research...").
[828] 42 U.S.C. § 242o ("From time to time the Secretary shall issue information related to public health, in the form of publications or otherwise, for the use of the public…).
[829] 42 U.S.C. § 243 ("The Secretary shall encourage cooperative activities between the States with respect to comprehensive and continuing planning as to their current and future health needs, the establishment and maintenance of adequate public health services, and otherwise carrying out public health activities. The Secretary is also authorized to train personnel for State and local health work").
[830] 42 U.S.C. § 247b.
[831] 42 U.S.C. § 247b-4.
[832] Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. §§ 9601 et seq.
[833] CONG. RESEARCH SERV., IF12241, *supra* note 824, at 2.

CDC also operates the National Biomonitoring Program, which detects chemicals and toxins in human tissue and publishes fact sheets on their health impacts. Priorities for this program include safe drinking water and protecting vulnerable populations from harmful environmental exposures.[834]

How the Public Health Service Act may support the interventions through information and data collection:
CDC's National Center for Environmental Health conducts laboratory research to improve the rapid and accurate detection of chemical threats and selected toxins. It also operates the National Biomonitoring Program that detects these in human tissue and publishes fact sheets on their health impacts. Priorities are: Ensure safe drinking water and protect vulnerable populations from harmful environmental exposures.

4. National Institute of Environmental Health Sciences

a. Health Research Extension Act of 1985 (amending the Public Health Service Act of 1944)

The National Institute of Environmental Health Sciences (NIEHS) is a division of the National Institute of Health (NIH) and serves as a research organization that studies how the environment affects people to prevent diseases and improve human health. The Health Research Extension Act of 1985[835] amends title IV of the Public Health Service Act to establish the NIH and, within the agency, the NIEHS.[836] NIEHS is funded through an annual appropriation by Congress and submits an annual Congressional Justification and Superfund Congressional Justification to be included in the President's budget.[837] Through its funding and in coordination with various environmental authorities, such as CERCLA, the NIEHS fulfills its stated purpose to "conduct and support research, training, health information dissemination, and other programs with respect to factors in the environment that affect human health, directly or indirectly."[838] This includes research related to plastic pollution in its various forms.[839]

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[834] Biomonitoring measurements come from participants in the National Health and Nutrition Examination Survey (NHANES), conducted by CDC's National Center for Health Statistics. *See National Report on Human Exposure to Environmental Chemicals*, CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/exposurereport/index.html (last visited Mar. 14, 2024).

[835] Health Research Extension Act of 1985, Pub. L. No. 99-158, 99 Stat. 820 (Nov. 20, 1985).

[836] *Id*. at § 401, 99 Stat. at 401(b)(1)(L); 42 U.S.C. § 281(16).

[837] *Congress*, NAT'L INST. OF ENVTL. HEALTH SCIS., https://www.niehs.nih.gov/about/congress (last visited Mar. 14, 2024).

[838] Health Research Extension Act of 1985, *supra* note 835, at § 463; 42 U.S.C. § 285I.

[839] *See, e.g.,* NIEHS, SUPERFUND-RELATED ACTIVITIES: THE SUPERFUND RESEARCH PROGRAM AND THE WORKER TRAINING PROGRAM, CONGRESSIONAL JUSTIFICATION FY 2025, https://www.niehs.nih.gov/sites/default/files/about/congress/justification/2025/2025_superfund_508.pdf (last visited Mar. 14, 2024) (highlighting research on PFAS and related health effects); Caroline Stetler, *NIEHS Grantees Help Lead Study of Ocean Plastics' Health Effects*, ENVTL. FACTOR, NIEHS (Apr. 2023), https://factor.niehs.nih.gov/2023/4/science-highlights/ocean-plastics-health-effects.

How the Health Research Extension Act may support the interventions through information and data collection:
National Institute of Environmental Health Sciences research focuses on discovering how the environment affects people to prevent diseases and improve human health, including research related to plastic pollution.

O. Department of Defense

1. Navy

a. National Defense Authorization Act for Fiscal Year 1994, mandating compliance with the Marine Plastic Pollution Research and Control Act

Though MARPOL exempts naval ships from its coverage, Congress required compliance by the U.S. Navy with MPPRCA through the National Defense Authorization Act for Fiscal Year 1994.[840] In response, and as part of the its Pollution Prevention (P2) Program,[841] the U.S. Navy implemented the "Plastic Removal in a Marine Environment" (PRIME) program to comply with the provision prohibiting the discharge of plastics into the oceans and waterways.[842] The PRIME Program Office's "responsibilities focus on the reduction or elimination of plastic consumable commodities going aboard Navy ships, [which] involves a comprehensive review of the governing specifications and ordering data as well as investigations of the commercial marketplace for new materials, products, processes, and ideas."[843] By focusing on reducing the use of consumable plastic items and introducing sustainable substitutes on Navy ships, the PRIME program has reduced the percentage of plastics in Navy ships' waste streams.[844]

The Naval Supply Systems Command (NSSC) reports that examples of the PRIME Program successes include the

[840] National Defense Authorization Act for Fiscal Year 1994, H.R. 2401, 103rd Cong. § 1003(c) (1994).
[841] The U.S. Navy's Pollution Prevention (P2) Program has four main objectives: (1) reduce the life cycle cost of the Navy's environmental quality program; (2) achieve sustained environmental compliance at Navy activities; (3) reduce generation of pollutants at Navy activities; and (4) increase use of P2 alternatives to meet environmental compliance requirements. All installations are required to develop P2 plans in order to minimize waste, reduce the release of pollutants, and reduce dependence on hazardous materials. These plans are required to be reviewed annually and revised at least every three years. *Pollution Prevention*, NAVFAC PACIFIC, https://pacific.navfac.navy.mil/Facilities-Engineering-Commands/NAVFAC-Far-East/Contact-Us/PWD-Yokosuka/Environmental-Division/Programs-Services/Pollution-Prevention/ (last visited Mar. 14, 2024).
[842] Joseph Wall, NATICK/TR-93/038, PLASTICS REMOVAL IN A MARINE ENVIRONMENT (PRIME) AN OVERVIEW, OCTOBER 1988 TO SEPTEMBER 1992 (1993).
[843] Naval Supply Systems Command, Asset Protection & Pollution Prevention (Code 007), https://www.navsup.navy.mil/NAVSUP-Enterprise/NAVSUP-Weapon-Systems-Support/LECP-Support/ (last visited Mar. 14, 2024).
[844] *Id*.

> introduction of paper-based dunnage and cushioning at [Defense Logistics Agency] and Navy supply depots to reduce the huge amount of plastic bubble wrap and foam that was difficult to manage aboard ships. A number of new products have been developed by suppliers in response to the PRIME Program including: non-plastic hot drink cups, biodegradable scrim toweling, and non-plastic trash bags.[845]

In addition to the PRIME Program, the U.S. Navy also administers a Waste Reduction Afloat Protects the Sea (WRAPS) Program "as part of the Navy's overall pollution prevention strategy that will allow the U.S. Forces to operate unencumbered around the world in the face of often-conflicting international disposal requirements."[846] The NSSC reports that the WRAPS program has several initiatives aimed at solid waste reduction, including the promotion of non-polluting technologies, and "awareness for waste reduction through the Navy and among its suppliers, vendors, and contractors."[847] To accomplish its waste reduction objectives, the WRAPS Program "thoroughly investigates the major constituents of the waste stream and evaluat[es] potential alternative products and technologies."[848]

The broad objective undergirding both the PRIME and WRAPS programs is to "evaluate supply initiatives to reduce and/or eliminate solid waste on Navy ships and submarines."[849]

How the U.S. Navy's PRIME and WRAPS programs may apply to Intervention 3, decrease waste generation through mandatory procurement rules favoring reusable products:
Through its PRIME and WRAPS programs, the Navy can continue to evaluate supply initiatives and act to reduce and/or eliminate solid waste, including plastic waste, through procurement of more sustainable products, materials, and processes to reduce plastic waste and at-sea disposal.[850]

P. Department of Labor

1. Occupational Safety and Health Administration

a. Occupational Safety and Health Act

The Occupational Safety and Health Act (OSH Act), implemented by the Occupational Safety and Health Administration (OSHA) and the Department of Labor, is the federal law that ensures worker

[845] *Id*.
[846] *Id*.
[847] *Id*.
[848] *Id*.
[849] Naval Supply Systems Command, Weapon Systems Support, Secretary of Defense Environmental Award for Sustainability, Nomination Narrative, https://www.denix.osd.mil/awards/denix-files/sites/12/2021/03/2-Nomination-Narrative-Navy-S-IT-NAVSUP-WSS_508C.pdf (last visited Mar. 14, 2024).
[850] *Id*.

and workplace safety. The law establishes a general duty for employers to provide "places of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm" and to "comply with occupational safety and health standards promulgated under this Act."[851] Most relevant to plastic pollution is that the law provides OSHA with authority to promulgate regulations "dealing with toxic materials or harmful physical agents" in the workplace and to ensure that "no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard."[852] OSHA works with the Department of Health and Human Services (HHS) to develop criteria for identifying toxic substances under the Act's purview.[853] The OSH Act also created the National Institute for Occupational Safety and Health (NIOSH), which is housed within HHS, to lead research into workplace hazards.[854] NIOSH translates its research into recommendations for OSHA to update or issue new safety and health standards.[855]

In implementing the OSH Act, OSHA has created workplace safety standards that cover broad industrial sectors, including construction, maritime, agriculture, and "general industry."[856] Most regulations affecting the plastics industry come under the "general industry" regulations.[857] The most relevant subpart for regulating exposure to plastic pollution in the workplace is Subpart Z of the "general industry" regulations, which covers toxic and hazardous substances.[858] Under these regulations, OSHA has established exposure limits for hundreds of airborne particle pollutants such as asbestos and talc.[859]

i. Existing OSHA Regulation of Plastics' Toxic and Hazardous Characteristics

The primary existing OSHA effort that addresses the environmental hazards associated with plastics manufacturing involves regulating isocyanates.[860] Isocyanates are organic compounds often used to

[851] 29 U.S.C. § 654.
[852] 29 U.S.C. § 655(b)(5).
[853] 29 U.S.C. § 655(b)(1).
[854] 29 U.S.C. § 671.
[855] 29 U.S.C. § 671(d).
[856] John D. Surma & Jeff T. Leslie, *OSH Law Primer, Part I: Understanding the OSH Act and OSHA,* OGLETREE DEAKINS (Jan. 11, 2024), https://ogletree.com/insights-resources/blog-posts/osh-law-primer-part-i-understanding-the-osh-act-and-osha/#:~:text=The%20OSH%20Act%20allows%20states,OSHA%20regulates%20private%2Dsector%20employment.
[857] *See, e.g.*, 29 C.F.R. § 1910.1000.
[858] 29 C.F.R. pt. 1910, subpt. Z.
[859] *See* 29 C.F.R. § 1910.1000.
[860] *See* 29 C.F.R. § 1910.1000; In 1998, OSHA also acted to educate employers about the increased risk of Legionnaire's disease from working in the plastic injection molding industry. OSHA issued a Safety and Health Information Bulleting, a guidance document with no legal effect, warning that "workers engaged in the manufacture of plastic parts using injection molding equipment may be at an increased risk for Legionnaires' Disease, a potentially life-threatening form of pneumonia." The concern came from high concentrations of Legionella Pneumophila found in in the water used to cool metal molds and the process equipment at a plastic injection molding facility in Cincinnati, Ohio. *See* Memorandum from Steven F. Witt, OSHA Dir. of Tech. Support, to OSHA Regional Administrators, State Designees, Consultation Program Managers on OSHA

manufacture foams, fibers, paints, insulation materials, and polyurethane products.[861] Isocyanates can become airborne during the manufacturing of these products or their chemical constituents.[862] The CDC and NIOSH consider isocyanates to be "powerful irritants to the mucous membranes of the eyes and gastrointestinal and respiratory tracts," noting they can contribute to asthma attacks and other respiratory issues.[863] OSHA regulates exposure to various isocyanates as air contaminants under the OSH Act, establishing exposure limits employers must guarantee to their employees through either administrative or engineering controls or personal protective equipment.[864]

ii. Potential Future OSHA Regulation of Plastics' Toxic and Hazardous Characteristics: Airborne Nano- and Microplastics

Plastics manufacturing processes, such as the mechanical degradation of plastics in the recycling processes or the intensive manipulation of polymer composites (such as laser cutting or high-speed drilling), can release airborne nano- and microplastics (NMPPs) into the workplace.[865] NIOSH has been studying safety and health problems associated with airborne NMPPs for at least the past four years.[866] NIOSH has acknowledged the potential for inhalation of NMPPs in some workplaces and stated that while the toxicity of inhaled NMPPs is varied, they present some known threats to worker safety.[867] For example, NIOSH has noted that "inhalation of thermal degradation products of polytetrafluoroethylene can lead to 'polymer fume fever' and in extreme cases to fatal acute pulmonary oedema."[868] While there are currently no occupational exposure limits for airborne NMPPs, NIOSH's Nanotechnology Research Center has developed approaches for exposure measurement, assessment and mitigation, and hazard characterization for nanomaterials generally. NIOSH says that "many of [these] approaches would also be applicable to characterize and minimize risk of nano- and microplastic in the workplace."[869] In the absence of any formal standards regulating NMPP exposure, NIOSH has recommended that voluntary workplace safety efforts "should focus on minimizing potential exposure through appropriate engineering controls such as isolation cabinets, exhaust ventilation, and utilizing good industrial hygiene practices."[870] Meanwhile, NIOSH says it is "engaged with its government partners to better understand potential

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Hazard Information Bulletins Legionnaires' Disease Risk for Workers in the Plastic Injection Molding Industry (Dec. 9, 1998), https://www.osha.gov/publications/hib19981209#ftnt.

[861] *Isocyanates*, CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/niosh/topics/isocyanates/default.html (last visited Mar. 14, 2024).

[862] DEP'T OF HEALTH & HUMAN SERVS., A SUMMARY OF HEALTH HAZARD EVALUATIONS: ISSUES RELATED TO OCCUPATIONAL EXPOSURE TO ISOCYANATES, 1989 TO 2002, No. 2004-116 (Jan. 2004).

[863] *Isocyanates*, *supra* note 861.

[864] 29 C.F.R. § 1910.1000.

[865] *See* Vladimir Murashov et al., *Are There Nano- and Microplastics in the Workplace?,* CTRS. FOR DISEASE CONTROL & PREVENTION (Feb. 19, 2020), https://blogs.cdc.gov/niosh-science-blog/2020/02/19/microplastics/?deliveryName=USCDC_170-DM20315.

[866] *Id.*

[867] *Id.*

[868] *Id*.

[869] *Id*.

[870] *Id*.

exposures to nano- and microplastics in the workplace, their hazards, and tools to minimize exposures."[871]

As NIOSH continues to study NMPPs, OSHA may have authority under the OSH Act to regulate NMPPs with similar exposure limits as those placed on asbestos, talc, and isocyanates. The Supreme Court has held that before OSHA can promulgate a permanent health or safety standard under the OSH Act, it must make a threshold finding that significant risk is present and that such risk can be eliminated or lessened by a change in practices.[872] OSHA standards must also be both technologically and economically feasible,[873] meaning that OSHA must demonstrate "within the limits of the best available evidence . . . that the typical firm will be able to develop and install engineering and work practice controls that can meet the [standard] in most of its operations."[874] Whether NMPPs or other substances exposed to worker's in plastic production facilities could meet these standards would require additional study.

How the Occupational Safety and Health Act may be applied to Intervention 1, reduce plastic production and pollution from production through regulation of production capacity and associated pollution:
Upon findings that airborne nano- and microplastics pose a significant risk to worker safety that could be eliminated or substantially lessened by an economically feasible change in manufacturing practices, OSHA could regulate plastic manufacturing processes by establishing permissible exposure limits to nano- and microplastic pollution.

How the Occupational Safety and Health Act may support the interventions through research and development activities:
Using its general research mandates under the OSH Act, the National Institute for Occupational Safety and Health (NIOSH) can study the risk nano- and microplastics pose to worker safety in the plastic manufacturing industry.

Q. Department of Justice

1. Section 13 of the Rivers and Harbors Act of 1899 ("Refuse Act")

The Rivers and Harbors Act (RHA) of 1899, commonly known as the Refuse Act of 1899 (33 U.S.C. §§ 401 et seq.), authorizes the federal regulatory permit program to protect navigable waters in the development of harbors and other construction and excavation. The U.S. Army Corps of Engineers

[871] *Id*.; Vladimir Murashov, *NIOSH Global Collaborations on Workplace Safety of Nanomaterials,* CTRS. FOR DISEASE CONTROL AND PREVENTION (Feb. 1, 2024), https://blogs.cdc.gov/niosh-science-blog/2024/02/01/nano-20-global/.
[872] *See* Indus. Union Dep't, AFL–CIO v. Am. Petroleum Inst. ("Benzene"), 448 U.S. 607, 641–42 (1980)
[873] *See* United Steelworkers of Am., AFL–CIO–CLC v. Marshall ("Lead 1"), 647 F.2d 1189, 1264 (D.C. Cir. 1980).
[874] *Id*.

implements the RHA. Section 13 of the RHA prohibits the discharge of any refuse—other than refuse "flowing from streets and sewers and passing therefrom in a liquid state"—from or out of, among others, any ship or floating craft of any kind into navigable waters or tributaries of navigable waters from which the same refuse would float or be washed into such navigable water unless otherwise permitted under a Corps permit.[875] Section 13 of the RHA also prohibits the deposit of "material of any kind in any place on the bank of a navigable water or tributaries of navigable waters" where the material may wash into such jurisdictional waters through ordinary or high tides, storms, floods, or otherwise.[876]

The RHA does not define what constitutes "refuse" or "any refuse matter of any kind" under the Refuse Act of 1899. The U.S. Supreme Court has articulated a broad definition that the term "refuse" "includes *all foreign substances and pollutants* apart from those 'flowing from streets and sewers and passing therefrom in a liquid state' into the watercourse."[877] Other courts of federal jurisdiction have found that the following materials are "refuse" within the meaning of section 13 of the RHA: "timber pilings set adrift as result of dock repair work;"[878] "oil;"[879] "peeled bark and sunken logs on [a] river bottom;"[880] and "acid iron, sulfates, manganese and other dissolved and *undissolved solids*."[881]

Section 13's second clause prohibiting the disposal of "material of any other kind" on banks of CWA jurisdictional waters may be even broader than the section's first clause of "any refuse matter of any kind;" however, courts have not drawn as clear of a distinction between these two terms. Given the broad interpretation of the term "refuse" under the RHA, however, the possibility remains that plastics (macro, micro, and nano) are not excluded from the section's coverage. Plastic may easily constitute "refuse" because it is definitively a "foreign substance" and, at a minimum, is a kind of "material" that may easily fall within the purview of section 13's second clause.

Section 11 of the RHA is the enforcement mechanism for section 13. Any person or corporation who violates or "knowingly aid[s], abet[s], authorize[s], or instigate[s] a violation" of section 13 will be found guilty of a misdemeanor, punishable by a fine of up to $25,000 per day or by imprisonment for at least 30 days and no longer than one year.[882] Courts with jurisdiction over RHA claims may, in their discretion, award half of the aforementioned fine to individuals who furnished information that led to the conviction under section 13.[883]

In practice, this would conceivably mean that the Department of Justice (DOJ)—entrusted through section 13 to enforce the RHA—has existing discretionary authority to prosecute violations of section 13, taking into account the effects of other federal water quality legislation. Put simply, the

[875] 33 U.S.C. § 407.
[876] *Id*.
[877] United States v. Standard Oil Co., 384 U.S. 224, 230 (1996) (emphasis added).
[878] Acme Boat Rentals, Inc. v. J. Ray McDermott & Co., 424 F.2d 393 (5th Cir. 1970).
[879] LaMerced, 84 F.2d 444 (9th Cir. 1936).
[880] United States v. Kennecbec Log Driving Co., 491 F.2d 562 (1st Cir. 1973).
[881] United States v. Consolidations Coal Co., 354 F. Supp. 173 (N.D. W.Va. 1973).
[882] 33 U.S.C. § 411.
[883] *Id*.

DOJ has existing authority to prosecute violators of section 13 of the RHA, which may include the disposal or discharge of plastics as "refuse."

How the Rivers and Harbors Act may apply to Intervention 6, increase enforcement for at-sea disposal:
Section 13 of the Rivers and Harbors Act prohibits the discharge of any refuse—other than refuse "flowing from streets and sewers and passing therefrom in a liquid state"—from or out of, among others, any ship or floating craft of any kind into navigable waters or tributaries of navigable waters from which the same refuse would float or be washed into such navigable water unless otherwise permitted under a Corps permit.884 "Refuse" under this Act may include plastic waste. The Department of Justice—authorized to enforce the Rivers and Harbors Act under section 11 of the Act—can prosecute violators of section 13's prohibition against the discharge of refuse, which may include plastic or plastic waste, from any ship or floating craft into navigable waters or tributaries of navigable waters.

[884] 33 U.S.C. § 407.

V. CONCLUSION

As examined throughout this report, several U.S. federal agencies have existing statutory and regulatory authorities to regulate within the lifecycle of plastics—from generation to waste management to recycling and reuse. Of the federal agencies assessed, EPA likely has the most numerous and relevant authorities to address plastic pollution. The report details several meaningful areas in which EPA can act that would require no further legislative action and, in some instances, obligate the agency to act.

Some of EPA's existing levers include updating and revising relevant guidelines and regulations (e.g., ELG and NAAQS) to comport with the agency's statutory obligations. Other EPA levers would require the agency to evaluate how macro, micro, and nanoplastics and their chemical constituents can be listed, categorized, or otherwise treated as a triggering pollutant or contaminant under federal laws, such as the CWA and CAA, and a suite of regulatory actions that would follow from such a listing. Under TSCA and EPCRA, EPA has existing authority to require public and agency disclosure from plastic production and manufacturing facilities, which can better inform the agency of areas in which it may need to dedicate additional regulatory effort. EPA also has ample grant making authority to fund projects that specifically address plastic pollution (i.e., via the IIJA) and authority to incentivize voluntary improvements in the design of plastic materials (i.e., via the Pollution Prevention Act).

Other agencies with authority to address plastic pollution include NOAA, which—in conjunction with EPA—could update the guidelines for the Coastal Nonpoint Pollution Program to mandate that states explicitly address nonpoint source plastic pollution in their Coastal Management Plans under the CZMA. NOAA also has ample grantmaking authority under the CZMA to incentivize state-led projects that may reduce plastic pollution in their coastal areas. NOAA's Marine Debris Program, reauthorized under the Save Our Seas Act, serves as a vehicle of support for projects across the country and internationally to prevent marine debris, such as abandoned fishing gear.

Other federal agencies have equally important roles to play in addressing plastic pollution, such as NMFS (via the MSA), DOI (via the R&HA and OSCLA), FDA (via the FD&CA and CPSA and its amendments), FTC (via the FTCA), NASA (via its authorities under its organic act), USCG (via the MPPRCA), U.S. Navy (via National Defense Authorization Acts), USDA (via Farm Bills), and DOE (via its organic act). The Executive Office of the President also can serve as a valuable tool to direct multiple agencies to take actionable steps to reduce plastic waste and promote a circular economy.

While the authorities examined in this report offer a glimpse into the substantial federal toolbox to address the plastic pollution crisis, the authors of this report note that additional legislative and executive authorization is likely needed to holistically address the multivariable issue of plastic pollution. The current lack of a singular, comprehensive federal authority to address domestic plastic pollution should not, however, prevent federal agencies with existing authorities to regulate within the life cycle of plastics.