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Plastic Pollution and Policy Considerations: Frequently Asked Questions

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SUMMARY

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Plastic Pollution and Policy Considerations: Frequently Asked Questions

Global and domestic plastic production has increased substantially since the mid-20th century—doubling in the last two decades. The durability, moldability, and versatility of plastic have led to its ubiquitous use, benefiting many aspects of society, including the food, medical, technology, textile, and transportation industries, among others. As plastic production and use have grown, so have concerns about the impacts of plastic on the environment. These include concerns about increasing rates of plastic waste generation, insufficient management of plastic waste, and the plastic pollution that results when plastic waste enters, or "leaks," into the environment, including land-based, freshwater, and marine ecosystems. Some are also concerned about the potential environmental and human health effects of the chemicals used to produce plastics and the air emissions generated across the plastic lifecycle.

Plastic waste generation has increased alongside the rise in plastic production and use, more than doubling over the last two decades globally. Infrastructure for solid waste management and recycling has not kept pace with this growth. While some plastic is recycled, most plastic waste is landfilled or incinerated. Some plastic waste is also *mismanaged* (i.e., littered or improperly disposed). Mismanaged plastic is the main source of larger plastics (i.e., *macroplastics*) entering into the environment.

Plastic waste enters the environment through a variety of pathways across the plastic lifecycle. Once in the environment, macroplastics may fragment into smaller pieces of plastic (i.e., *microplastics*, ranging in size from 5 millimeters down to a 5-millionfold-smaller 1 nanometer). Both macroplastics and microplastics pose risks to the environment, including land-based, freshwater, and marine ecosystems. Some of the impacts of concern include wildlife ingesting plastic or becoming entangled in plastic waste, which can lead to suffocation or starvation. Microplastics are also persistent and may accumulate in the environment—such as in deep ocean sediments, water columns of oceans and lakes, soils, or the atmosphere—and in organisms (both humans and wildlife).

The risks from plastic pollution arise from the physical plastic particles and from the potential toxicity of the chemicals from which the plastics are made. In addition, pollutants can adhere to plastics in the environment, posing further potential risk when ingested or inhaled. To this end, some are concerned about the potential impact of microplastics (including a subset of microplastics called *nanoplastics*, which are smaller than 1,000 nanometers) on human health when ingested or inhaled, particularly with regard to the chemicals found in plastics. Experts continue to research the potential effects of microplastics.

Other environmental impacts include air emissions generated across the plastic lifecycle. The processes used to produce plastic and for certain post-use disposal practices (e.g., incineration and recycling) generate greenhouse gas and other air emissions that have the potential to contribute to climate change and air quality concerns.

Gaps remain in understanding the magnitude and scope of these environmental impacts and the extent to which various sources of plastic contribute to these impacts. Observers have highlighted the importance of further research to better understand the plastic lifecycle, as well as the fate, transport, and effect of plastic pollution in the environment, to inform the adoption of effective policy options. Studies suggest that the adoption of policies across the lifecycle of plastic are needed to address the wide-ranging concerns associated with plastic pollution.

Congress has shown interest in issues across the plastic lifecycle and has passed legislation, introduced bills, and held hearings to investigate and address various plastic-pollution-related concerns. Many federal agencies also have taken, and continue to take, steps to address plastic-pollution-related issues within their mission areas. The United States is also engaging in international efforts to address plastic pollution, most notably through global negotiations toward an international legally binding instrument on plastic pollution.

Contents

Figures

Tables

Appendixes

Contacts

Introduction

Plastics have numerous valuable uses and benefit many aspects of society (e.g., food, medical, technology, textile, and transportation industries). Several characteristics of plastics—such as malleability, durability, versatility, strength, light weight, corrosion resistance, and low cost relative to other materials—have led to their widespread use.

The generally short service life of many plastic products, such as single-use plastics, and the limited reuse and recycling of plastic products have led to an accumulation of plastic waste in landfills as well as the environment. Plastic, including plastic waste, may enter, or "leak," into the environment at various stages throughout the plastic lifecycle, polluting land-based, freshwater, and marine ecosystems.[1] While plastics have many benefits, this accumulation of plastic waste in landfills and the environment has social, economic, and environmental consequences.[2]

Concerns about these consequences have prompted calls both domestically and globally to improve the *circularity* of plastics and to implement various policy options across the plastic lifecycle to address plastic pollution (including plastic-related pollution such as air emissions).[3] *Circularity* is the concept of an economy (i.e., a *circular economy*) that aims to keep materials and products in circulation for as long as possible—optimizing resource use and minimizing waste and environmental impacts through redesigning materials, products, and systems to use resources more efficiently.[4] Although stakeholders generally agree that the extent of plastic pollution, both domestically and globally, has reached a point that requires action, views vary as to the appropriate focus, stringency, and breadth of actions to be taken.

Some Members of Congress have shown increasing interest in addressing issues related to plastic pollution generated across the plastic lifecycle. Congress has passed legislation, introduced bills, and held hearings to investigate and address various plastic-related issues.[5] Federal agencies have also taken, and continue to take, steps to address plastic-pollution-related issues within their mission areas, including research and the use of authorities to address the impacts of plastic pollution under various statutes. Recent international negotiations aiming to develop an international agreement on plastic pollution have heightened congressional interest as well as debate about the appropriate domestic and global approaches that should be considered or adopted to address plastic pollution.

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[1] National Academies of Sciences, Engineering, and Medicine (NASEM), *Recycled Plastics in Infrastructure: Current Practices, Understanding, and Opportunities*, 2023, p. 19, https://nap.nationalacademies.org/catalog/27172/recycled-plastics-in-infrastructure-current-practices-understanding-and-opportunities (hereinafter NASEM, *Recycled Plastics in Infrastructure*).

[2] NASEM, *Recycled Plastics in Infrastructure*.

[3] Organisation for Economic Co-operation and Development (OECD), *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, February 2022, p. 14, https://www.oecd-ilibrary.org/environment/global-plastics-outlook_de747aef-en (hereinafter OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*); U.S. Environmental Protection Agency (EPA), *National Strategy to Prevent Plastic Pollution*, 2024, https://www.epa.gov/circulareconomy/national-strategy-prevent-plastic-pollution (hereinafter EPA, *National Strategy to Prevent Plastic Pollution*); America's Plastic Makers and American Chemistry Council (ACC), *5 Actions for Sustainable Change: A Plan for Congress to Accelerate a Circular Economy for Plastics*, July 2021, p. 2, https://plasticmakers.org/wp-content/uploads/2022/07/5-Actions-for-Sustainable-Change.pdf (hereinafter America's Plastic Makers and ACC, *5 Actions for Sustainable Change*); United Nations Environment Programme (UNEP), *Turning Off the Tap: How the World Can End Plastic Pollution and Create a Circular Economy*, 2023, https://wedocs.unep.org/bitstream/handle/20.500.11822/42277/Plastic_pollution.pdf (hereinafter UNEP, *Turning Off the Tap*).

[4] EPA, "What is a Circular Economy?" https://www.epa.gov/circulareconomy/what-circular-economy.

[5] See **Table 5** for legislation introduced in the 118th Congress. Enacted legislation includes Save our Seas Act of 2018 (P.L. 115-265) and the Save Our Seas 2.0 Act (P.L. 116-224) in 2020. For hearings, see, for example, U.S. Congress, Senate Environment and Public Works Committee, A Joint Hearing to Examine the Presence of Microplastics in Water, 118th Cong., 2nd sess., February 27, 2024.

This report addresses frequently asked questions (FAQs) pertaining to plastic pollution and policy considerations to address such pollution while retaining beneficial uses of plastic. The report begins with a brief overview of the lifecycle of plastic and then addresses questions organized by stages of the plastic lifecycle. Next, the report answers frequently asked questions about plastic pollution, the environmental and health-related impacts of plastic pollution across the plastic lifecycle, and steps federal agencies have taken to address plastic-pollution-related issues within their mission areas, including the use of authorities under various statutes. The report then answers frequently asked questions about U.S. engagement in international agreements pertaining to plastic pollution, including ongoing efforts through the Intergovernmental Negotiating Committee on Plastic Pollution. The report concludes with a discussion of potential policy options available to Congress to address plastic pollution.

What Is the Lifecycle of Plastic?[6]

The extraction of raw materials, conversion into products, and the use and disposal of a product is often referred to as the product's *lifecycle*. **Figure 1** depicts the idealized lifecycle of plastic, including resource extraction, production, product manufacturing, use, and post-use disposal.

Resource Extraction

Over 90% of plastic is derived from fossil fuels, such as crude oil and natural gas.[7] These fuels are extracted through processes such as drilling and hydraulic fracturing (i.e., fracking). Less than 1% of plastic is biobased (i.e., derived from certain renewable sources such as corn or sugarcane).

Plastic Production and Product Manufacturing

The raw extracted materials are shipped to refineries and petrochemical facilities, where they are converted into monomers, polymers, and pre-production plastics (e.g., pellets, which are often referred to as *nurdles*).[8] These pre-production plastics are then transported to facilities where they are formed into various products for consumption. The production and manufacturing phases of the plastic lifecycle also involve product design, which considers aspects such as the desired strength, appearance, and recyclability of the product, among many other aspects.

Consumption/Use

Plastics are used or consumed for a wide variety of purposes—such as packaging, construction, clothing/textiles, medical supplies, technology, transportation, agriculture, and fishing gear.[9] In some cases, these products are used for *durable applications* (e.g., appliances, automotive parts, consumer electronics, furniture, tires).[10] In other cases, they are used for *nondurable applications* where they are

[6] Laura Gatz, Specialist in Environmental Policy, authored this section.

[7] OECD, *Climate Change and Plastics Pollution: Synergies Between Two Crucial Environmental Challenges*, 2023, p. 2, https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/05/climate-change-and-plastics_d3364145/5e0bfe87-en.pdf; and NASEM, *Reckoning with the U.S. Role in Global Ocean Plastic Waste* (Washington, DC: The National Academies Press, 2022), p. 32, https://nap.nationalacademies.org/catalog/26132/reckoning-with-the-us-role-in-global-ocean-plastic-waste (hereinafter NASEM, *Reckoning with the U.S. Role in Global Ocean Plastic Waste*).

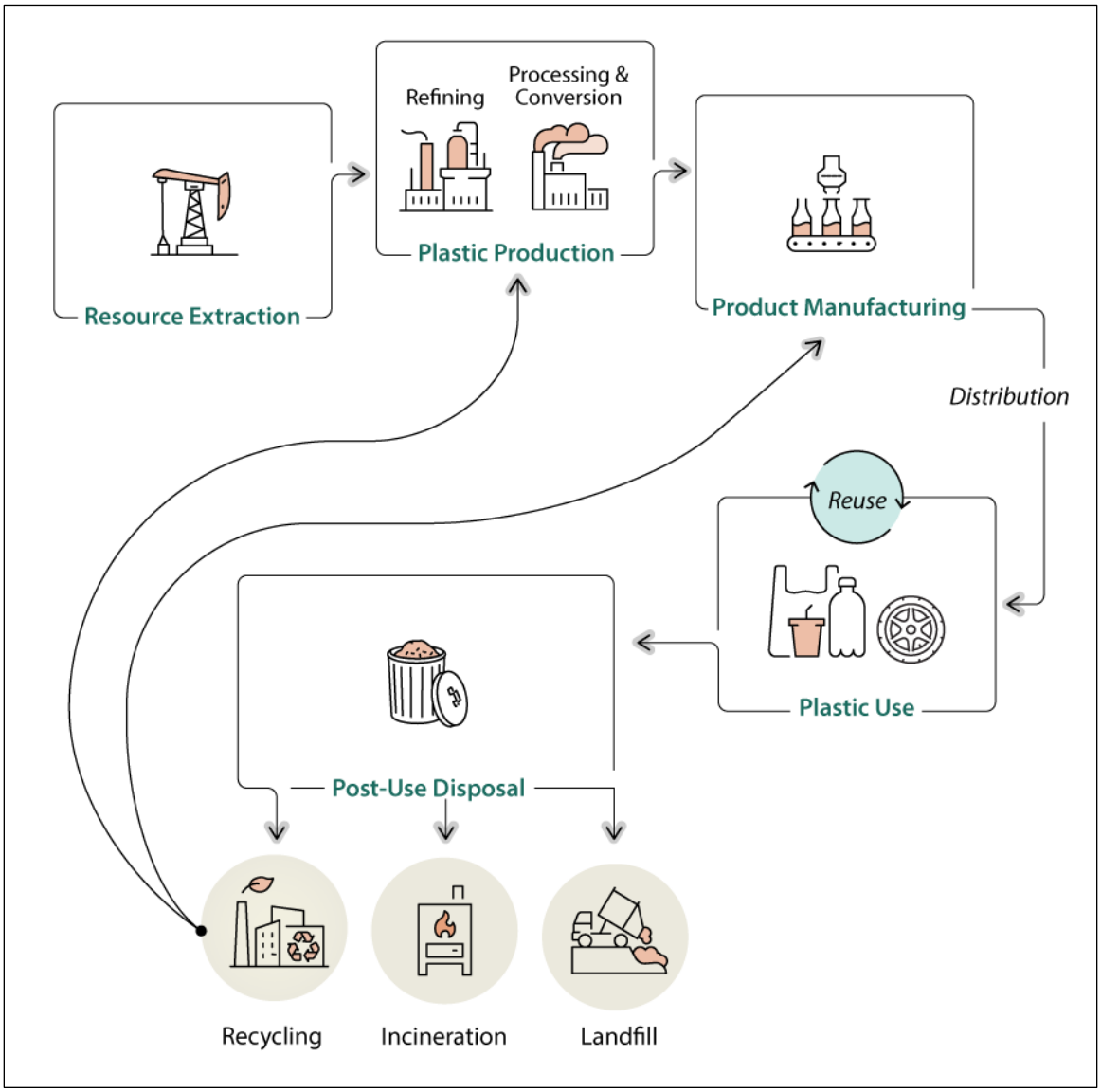
[8] A *monomer* is defined as a molecule of any of a class of compounds, mostly organic, that can react with other molecules to form *polymers*.

[9] ACC, "Plastics," https://www.americanchemistry.com/chemistry-in-america/chemistry-in-everyday-products/plastics.

[10] EPA, "Facts and Figures About Materials, Waste, and Recycling; Plastics: Material-Specific Data," https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data (hereinafter EPA, "Facts and Figures About Materials, Waste, and Recycling").

used for less than three years and discarded. Nondurable applications include *single-use plastics*, which are intended to be used once and then discarded. Examples of nondurable applications include clothing, bags, cups, straws, utensils, diapers, and medical devices.[11]

Figure 1. Idealized Lifecycle of Plastic



Source: Congressional Research Service.

Post-Use Disposal

Once a plastic product reaches the end of its useful life, it may be discarded. Most plastic waste is landfilled or incinerated. Some plastic waste is recycled and converted into new plastic products, which are then considered *secondary plastics*.[12] Some plastics may be recycled through mechanical recycling

[11] EPA, "Facts and Figures About Materials, Waste, and Recycling."

[12] OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, p. 23.

(i.e., traditional) or chemical recycling (i.e., advanced) approaches.[13] Plastic waste may also be mismanaged (i.e., improperly disposed) or littered.[14]

Leakage to the Environment/Environmental Pollution

Plastic may enter, or "leak," into the environment at various stages throughout the plastic lifecycle, including the production, manufacturing, use, and post-use disposal phases, leading to plastic pollution.[15] For example, during production and manufacturing, pre-production pellets (i.e., nurdles) may spill during transportation or be washed away from land-based sources to waterways via stormwater. Leakage during use includes the "wear and tear" of tires and loss of microplastics, or microfibers shedding from clothing during wash cycles into wastewater.[16] During the post-use disposal phase, plastic may leak via littering or mismanaged waste.

Production and Use FAQs

What Are Plastics?[17]

The term *plastics* generally describes a substance or material consisting of multiple chains of repeating molecular units (i.e., polymers or copolymers) combined with chemical additives that allow the material to be pliable with heat and pressure.[18] Most petrochemicals used to make plastics are generally derived from natural gas, feedstocks derived from natural gas processing, and feedstocks derived from crude oil refining.[19] These petrochemicals vary widely in terms of their chemical composition and properties. Bioplastics may be produced from certain renewable sources that are biobased (e.g., corn or sugar cane), but their production also involves other chemicals to form the final product.[20]

Plastics may be produced for a variety of uses in consumer products and industrial and commercial applications across multiple economic sectors.[21] Examples of some common applications and uses that illustrate the diversity of plastics include

- materials used in building construction and other infrastructure;

[13] Chevron Phillips Chemical, "Recycling Plastics," https://www.cpchem.com/sites/default/files/2021-02/Recycling%20Plastics_0.pdf; and Berlin Packaging, "Mechanical and Advanced Recycling: Moving Toward a Circular Economy," https://www.berlinpackaging.com/insights/sustainability/mechanical-and-advanced-recycling.

[14] OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, pp. 19-20, 42, 46. The proportion of mismanaged waste is higher in low- and middle-income countries or areas that do not have adequate collection or treatment facilities. Examples of mismanaged waste include plastic waste that is not collected, is collected but disposed of in open dumpsites or waterways, or is collected and burned in open pits.

[15] EPA, "About Plastic Products and Plastic Pollution," https://www.epa.gov/plastics/about-plastic-products-and-plastic-pollution.

[16] *Microplastics* are plastic particles ranging in size from 5 mm, which is about the size of a pencil eraser, to 1 nanometer.

[17] Jerry H. Yen, Analyst in Environmental Policy, authored this section.

[18] For additional information on chemicals used in plastics production, see a summary of this topic presented in "Chapter 2: Plastic Production and Global Trade" in NASEM, *Reckoning with the U.S. Role in Global Ocean Plastic Waste*, pp. 31-46. This National Academies report otherwise primarily focuses on the disposal of plastics that may enter the ocean.

[19] U.S. Energy Information Administration, "How Much Oil Is Used to Make Plastic?" https://www.eia.gov/tools/faqs/faq.php?id=34&t=6.

[20] For additional information, see Plastics Industry Association, "Bioplastics," https://www.plasticsindustry.org/who-we-serve/recycling-sustainability/bioplastics/.

[21] For additional information on types and volumes of plastics products manufactured for various applications or uses, see Plastics Industry Association, "Plastics Data," https://www.plasticsindustry.org/data.

- components used in modes of transport, including aircraft, trains, motor vehicles, and bicycles;
- components used in many devices or consumer products, including electronic devices, plumbing fixtures and piping, tools, sporting and other recreational equipment, and toys;
- packaging materials;
- storage and shipping containers;
- materials used in textiles (e.g., clothing, carpets, upholstery);
- service ware, containers, and utensils for food and beverages; and
- military or other specialized applications.

In addition to plastic products, some plastics are used as resins that are incorporated as part of another product, or as coatings applied to the surface of another product.

What Chemicals Are Used in Plastic Production?[22]

The potential universe of chemicals used in plastic production may number in the thousands across the breadth of the entire plastics industry.[23] The specific chemicals used to produce plastics may vary depending on the feedstocks, chemical processes, and chemical additives necessary to create the type of material, resin, or coating desired for the intended application or use of a product.[24] Desired qualities for products vary widely in terms of structural density; weight; flexibility; resistance to impact, heat, stains, or water; and other qualities. The chemicals used to make a particular plastic often differ from the chemical composition of the final product. For example, ethylene is used to make polyethylene, but these substances are chemically different in terms of their molecular structure and related properties.[25]

In terms of volume, plastic products are predominantly manufactured from several basic resins, including polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polystyrene (PS), and polyethylene terephthalate (PET).[26] Other plastic resins also may be produced for certain specialized applications, such as polyamides (e.g., nylon) and acrylonitrile butadiene styrene (ABS) polymer. To produce these plastic resins from chemical feedstocks, manufacturers may use various catalysts and other chemical processing agents that generally are not intended as an ingredient in the final product but may be present in trace amounts, sometimes referred to as an *impurity*.[27]

The types of chemicals used in plastics production also may vary depending on the additives needed to produce certain materials, resins, or coatings. For example, plastic resins may include additives to modify the qualities of a resin to enhance its structural stability or other desired qualities. Examples of additives include plasticizers, flame retardants, and pigments, for which the chemical constituencies would vary depending on the specific additive.[28] Additives also may be used in surface coatings applied to plastics.

[22] Jerry H. Yen, Analyst in Environmental Policy, authored this section.

[23] UNEP and Secretariat of the Basel, Rotterdam, and Stockholm Conventions, *Chemicals in Plastics: A Technical Report* (Geneva, Switzerland: UNEP, 2023), p. 2.

[24] "Chapter 1: Introduction" in NASEM, *Reckoning with the U.S. Role in Global Ocean Plastic Waste*, pp. 17-29.

[25] See the section on "Ethylene" in ACC, "Olefins, Uses & Benefits," https://www.americanchemistry.com/industry-groups/olefins/uses-benefits.

[26] For a discussion on the chemical structure of basic plastic resins and trends in plastic resin production, see "Chapter 2: Plastic Production and Global Trade" in NASEM, *Reckoning with the U.S. Role in Global Ocean Plastic Waste*, pp. 31-46.

[27] UNEP and Secretariat of the Basel, Rotterdam, and Stockholm Conventions, *Chemicals in Plastics: A Technical Report* (Geneva, Switzerland: UNEP, 2023), p. 6.

[28] For examples of additives that may be added to plastic products, see UNEP and Secretariat of the Basel, Rotterdam, and Stockholm Conventions, *Chemicals in Plastics: A Technical Report* (Geneva, Switzerland: UNEP, 2023), pp. 10-11.

Chemicals used at facilities that produce a plastic material, resin, or coating may differ from chemicals used at other facilities that further process the plastic or that manufacture the final product. Chemical additives used to produce the same type of plastic also may vary among manufacturers depending on the desired qualities of the final product.

What Is the Global Trend for Plastic Production?[29]

The Organisation for Economic Co-operation and Development (OECD) estimates that global plastic production doubled from 234 million metric tons (Mt) in 2000 to 460 Mt in 2019.[30] The projections for future plastic production differ for primary plastics (i.e., plastics produced from fossil-fuel-based or biobased feedstocks that have never been used or processed) and secondary plastics (i.e., plastics made from recycled material). By 2060, primary plastic production is projected to increase from approximately 431 Mt in 2019 to approximately 1,087 Mt, and secondary plastic production is projected to increase from approximately 29 Mt to approximately 143 Mt.[31]

How Much Plastic Is Produced in the United States?[32]

The American Chemistry Council, an industry trade association, estimates that, as of August 2024, U.S. production of plastic resin during the first eight months of 2024 totaled about 67.7 billion pounds, a 5.7% increase compared to the same period in 2023.[33] The U.S. Bureau of Economic Analysis (BEA) estimates that the gross monetary output for plastic material and resin manufacturing in 2023 was about $109.7 billion.[34] The gross output for plastic product manufacturing in 2023 was about $248.3 billion, based on BEA data provided in **Table 1**.

Table 1. Gross Output for Plastic Product Manufacturing by Industry

In billions of dollars, 2023

NAICS Code	Industry	Gross Output (USD)
32611	Plastics packaging materials and unlaminated film and sheet manufacturing	$47.6
32612	Plastics pipe, pipe fitting, and unlaminated profile shape manufacturing	$27.0
32613	Laminated plastics plate, sheet (except packaging), and shape manufacturing	$4.4
32614	Polystyrene foam product manufacturing	$11.1
32615	Urethane and other foam product (except polystyrene) manufacturing	$14.0
32616	Plastics bottle manufacturing	$15.6
32619	Other plastics product manufacturing	$128.6

[29] Clare Y. Cho, Specialist in Industrial Organization and Business Policy, authored this section.

[30] OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, pp. 14, 19. CRS is unaware of other authoritative sources that provide global estimates for plastic production, use, and disposal.

[31] OECD, *Global Plastics Outlook: Policy Scenarios to 2060*, June 21, 2022, p. 25, https://doi.org/10.1787/aa1edf33-en (hereinafter OECD, *Policy Scenarios to 2060*).

[32] Clare Y. Cho, Specialist in Industrial Organization and Business Policy, authored this section.

[33] ACC, "ACC Releases August 2024 Resin Production and Sales Statistics," press release, September 27, 2024, https://www.americanchemistry.com/chemistry-in-america/news-trends/press-release/2024/acc-releases-august-2024-resin-production-and-sales-statistics.

[34] The North American Industry Classification System code is 325211.

Source: U.S. Bureau of Economic Analysis, Gross Output by Industry—Detail Level, https://apps.bea.gov/iTable/?reqid=150&step=2&isuri=1&categories=ugdpxind&_gl=1*1ivo8kz*_ga*NzgxOTAyNzEwLjE3MjU0NTYyODg.*_ga_J4698JNNFT*MTczMDIyMjg0My40LjEuMTczMDIyMjk1MC4xNS4wLjA.

Notes: NAICS = North American Industry Classification System. NAICS codes 32617 and 32618 do not exist. For more information about each NAICS code, see U.S. Census Bureau, "North American Industry Classification System," https://www.census.gov/naics/?input=31&chart=2022.

How Much Plastic Is Used Across Countries?[35]

OECD estimates that global plastics use increased from approximately 130 Mt to 460 Mt from 1990 to 2019 (**Table 2**).[36] In 1990, the United States had the greatest plastics use among countries at approximately 42 Mt (32% of global plastics use), followed by the European OECD countries (OECD EU) at approximately 33 Mt (25% of global plastics use).[37] In 2019, China had the greatest plastics use at approximately 94 Mt (20% of global plastics use), followed by the United States at approximately 84 Mt (18% of global plastics use) and the OECD EU at approximately 64 Mt (14%). When measured per capita, in 2019, the United States and Canada had the greatest use of plastics (**Table 2**).

Based on current trends, global plastics use is projected to increase from 435 Mt in 2020 to 736 Mt in 2040 and 1,231 Mt in 2060.[38]

Table 2. Global Plastics Use by Region

In millions of metric tons (Mt)

		Plastics Use (1990)	Plastics Use (2019)	Plastics Use Per Capita (kilogram/population, 2019)
OECD America	United States	42.0	84.3	255.2
	Canada	3.7	7.5	202.2
	Other OECD America	4.8	13.1	65.4
OECD Europe	OECD EU	32.8	63.7	152.9
	OECD non-EU	8.1	21.4	124.3
OECD Pacific	OECD Asia	5.9	18.2	102.4
	OECD Oceania	0.6	4.4	143.9
Other America	Latin America	3.7	22.9	50.9
Eurasia	Other EU	1.2	3.3	103.0
	Other Eurasia	5.5	21.0	66.7
Middle East and Africa	Middle East and North Africa	5.6	21.2	47.1
	Other Africa	2.8	17.9	15.9
Other Asia	China	7.8	94.0	69.0
	India	1.9	29.3	22.1

[35] Clare Y. Cho, Specialist in Industrial Organization and Business Policy, authored this section.

[36] In the OECD estimates, each year, the total amount of global plastic production equals global plastic use.

[37] OECD EU includes the United Kingdom.

[38] OECD, *Policy Scenarios to 2060*, p. 62; and OECD, *Policy Scenarios for Eliminating Plastic Pollution by 2040*, October 2, 2024, p. 11, https://www.oecd-ilibrary.org/environment/policy-scenarios-for-eliminating-plastic-pollution-by-2040_76400890-en (hereinafter OECD, *Policy Scenarios for Eliminating Plastic Pollution by 2040*).

	Plastics Use (1990)	Plastics Use (2019)	Plastics Use Per Capita (kilogram/population, 2019)
Other non-OECD Asia	3.5	37.6	31.7
Total Global Use	**129.9**	**459.7**	

Source: Organisation for Economic Co-operation and Development (OECD), Global Plastics Outlook Database, "Plastics Use by Region," https://stats.oecd.org/Index.aspx?DataSetCode=PLASTIC_USE_9; and OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, 2022, p. 39, https://doi.org/10.1787/de747aef-en.

Note: Estimates for "plastics use" were rounded to the nearest tenth to match the "plastics use per capita" data reported in OECD's *Global Plastics Outlook* report. EU = European Union. For a list of countries within each region, see OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, 2022, p. 159, https://doi.org/10.1787/de747aef-en.

Post-Use Disposal FAQs

What Happens to Plastic Waste?[39]

The U.S. Environmental Protection Agency (EPA) and OECD report different estimates for the amount of plastic waste produced in the United States and how the plastic waste was disposed. EPA estimates that in 2018, the United States generated about 32 Mt of plastic waste, with about 8% of the waste recycled, 16% of the waste combusted with energy recovery, and 76% of the waste landfilled (**Table 3**).[40] OECD estimates that in 2019, the United States produced about 73 Mt of plastic waste, with about 5% recycled, 19% incinerated, 73% landfilled, and the remaining 3% mismanaged or littered.[41] The differences in estimations likely reflect different data sources and methodologies used by the OECD and EPA.[42] For example, the EPA estimates only consider plastics that have entered the waste management system, and thus does not include estimates for plastics that were mismanaged or littered.[43] In contrast, the OECD provides estimates to illustrate the flow of plastics throughout their lifecycle, and thus provides estimates for plastics that were mismanaged or littered.

Table 3. Plastics in Municipal Solid Waste

In millions of metric tons (Mt)

	1960	1970	1980	1990	2000	2005	2015	2017	2018
Generation	0.4	2.6	6.2	15.5	23.2	26.7	28.5	31.3	32.1
Recycled	—	—	0.01	0.3	1.3	1.6	2.3	2.8	2.7

[39] Clare Y. Cho, Specialist in Industrial Organization and Business Policy, authored this section.

[40] The most recent data provided on EPA's website is for 2018. See EPA, "Plastics: Material-Specific Data," https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data.

[41] OECD, *Economic Drivers, Environmental Impacts, and Policy Options*, pp. 19-20.

[42] For more information on EPA's methodology, see EPA Office of Resource Conservation and Recovery, *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures*, methodology document, April 2014, https://www.epa.gov/sites/default/files/2018-03/documents/methodolgy_document_for_selected_municipal_solid_waste_products.pdf. For more information on the OECD's methodology, see OECD, *Modelling Plastics in ENV-Linkages*, technical report, December 7, 2022, https://www.oecd.org/en/publications/modelling-plastics-in-env-linkages_59b639f7-en.html.

[43] For more information, see U.S. EPA, "Guide to the Facts and Figures Report About Materials, Waste and Recycling," last updated April 2, 2024, https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/guide-facts-and-figures-report-about.

	1960	1970	1980	1990	2000	2005	2015	2017	2018
Combustion with Energy Recovery	—	—	0.1	2.7	3.7	3.9	4.1	4.8	5.1
Landfilled	0.4	2.6	6.1	12.5	18.1	21.1	22.1	23.6	24.3

Source: U.S. Environmental Protection Agency (EPA), "Plastics: Material-Specific Data," last updated September 30, 2024, https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data.

Note: CRS converted EPA estimates from U.S. tons (i.e., short tons) to metric tons by multiplying the estimates by 0.9071847 (see U.S. Energy Information Administration, "Frequently Asked Questions: How Do I Convert Between Short Tons and Metric Tons?" https://www.eia.gov/tools/faqs/faq.php?id=7&t=2). The EPA uses plastics information from the American Chemistry Council, the National Association of PET Container Resources, and the Association of Plastic Recyclers to obtain their estimates. Values are rounded up to the nearest tenth.

OECD estimates that global plastic waste, including the waste generated in the United States, was about 353 Mt in 2019, with approximately 33 Mt (9%) recycled, 67 Mt (19%) incinerated, and 174 Mt (49%) landfilled; the remaining 23% was disposed in uncontrolled dumpsites, burned in open pits, or leaked into the environment.[44] OECD projects that, based on current trends, global plastic waste will triple from approximately 353 Mt in 2019 to approximately 1,014 Mt in 2060.[45] Approximately 176 Mt (17%) is projected to be recycled, 179 Mt (18%) to be incinerated, and 507 Mt (50%) to be landfilled, with the remaining 15% projected to be mismanaged.[46] The accumulated stock of plastics in aquatic environments—such as streams, rivers, lakes, seas, and the ocean—is projected to increase from approximately 140 Mt in 2019 to approximately 493 Mt in 2060.[47]

How Does the Amount of Plastic Waste Collected for Recycling in the United States Compare to Other Countries?[48]

In 2019, the United States had the third-highest amount of plastic waste that was collected for recycling, according to OECD estimates (**Table 4**). OECD estimates that about 6.5 Mt of plastic waste was collected for recycling in 2019 in the United States. The estimates indicate China collected the greatest amount for recycling at 13.2 Mt, followed by the OECD EU at 12.8 Mt. OECD Oceania collected the least at 0.2 Mt.[49]

Table 4. Global Plastic Waste Collected for Recycling by Region

In millions of metric tons (Mt), 2019

		Plastic Waste Collected for Recycling
OECD America	United States	6.5
	Canada	0.8
	Other OECD America	1.7
OECD Europe	OECD EU	12.8

[44] OECD, Global Plastics Outlook Database, "Plastics Waste by End-of-Life Fate and Region," https://doi.org/10.1787/e4e8c086-en; and OECD, *Economic Drivers, Environmental Impacts, and Policy Options*, p. 20.

[45] OECD, *Policy Scenarios to 2060*, p. 29.

[46] OECD, *Policy Scenarios to 2060*, p. 25.

[47] OECD, *Policy Scenarios to 2060*, pp. 30, 32.

[48] Clare Y. Cho, Specialist in Industrial Organization and Business Policy, authored this section.

[49] The countries in OECD Oceania are Australia and New Zealand. See OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, p. 159.

		Plastic Waste Collected for Recycling
	OECD Non-EU	2.3
OECD Pacific	OECD Asia	2.6
	OECD Oceania	0.2
Other America	Latin America	2.8
Eurasia	Other EU	0.2
	Other Eurasia	1.4
Middle East and Africa	Middle East and North Africa	1.4
	Other Africa	1.3
Other Asia	China	13.2
	India	3.7
	Other non-OECD Asia	3.7

Source: Organisation for Economic Co-operation and Development (OECD), Global Plastics Outlook Database, "Plastic Waste Collected for Recycling," https://doi.org/10.1787/09084a0e-en.

Note: EU = European Union. For a list of countries within each region, see OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, 2022, p. 159, https://doi.org/10.1787/de747aef-en.

How Is Plastic Waste Regulated at the Federal Level?[50]

When most plastic products, such as those used by consumers or households, are disposed of, these products are treated as municipal solid waste (MSW). EPA regulates MSW under the Resource Conservation and Recovery Act (RCRA) Subtitle D.[51] RCRA prohibits open dumping of any waste. Under RCRA, how a waste must be managed—and which level of government bears primary responsibility for managing it—depends on whether it is a solid waste or hazardous waste, as those terms are defined by the statute.[52] Plastic waste is generally considered a non-hazardous solid waste under RCRA, and so its management is overseen by states, local governments, or tribes. EPA regulations established minimum standards for solid waste management, including criteria for sanitary landfills where most non-hazardous plastic waste is ultimately disposed.[53] Specific regulatory requirements for landfills include location restrictions, operation and design standards, groundwater monitoring requirements, site closure requirements, and financial assurance requirements. Each state administers its own solid waste disposal program, which can have more stringent requirements than federal requirements.

In certain cases, plastic waste exhibiting hazardous characteristics, as defined under RCRA, may be subject to requirements under RCRA Subtitle C, covering hazardous waste management.[54] Under RCRA, a solid waste, such as a plastic product intended for disposal, would be considered a hazardous waste if it exhibits certain characteristics (ignitability, corrosivity, reactivity, or toxicity), or if EPA specifically lists the waste as such.[55] EPA has broad authority to regulate hazardous waste from its generation to its ultimate disposal (and beyond, if disposal leads to contamination of air, soil, or water). Plastic products,

[50] Angela C. Jones, Analyst in Environmental Policy, authored this section.

[51] Codified generally at 42 U.S.C. §§6901-6992k. The Resource Conservation and Recovery Act (RCRA) amended earlier legislation, the Solid Waste Disposal Act of 1965 (P.L. 89-272), but the amendments were so comprehensive that the act is commonly referred to as "RCRA," rather than its official title.

[52] 42 U.S.C. §6903; 40 C.F.R. §§261.2, 261.3.

[53] 40 C.F.R. Part 258.

[54] 42 U.S.C. §§6921-6939(f).

[55] 40 C.F.R. Part 261.

however, are generally chemically inert and lack hazardous characteristics compared to RCRA-covered hazardous waste.[56] Waste from a plastic manufacturing process, as opposed to plastic product waste, has different characteristics and would be subject to different regulations.

Under Subtitle C, land disposal of hazardous waste is prohibited unless the waste is first treated to meet certain treatment standards or other conditions are met.[57] Specifically, Subtitle C includes federal minimum standards applicable to hazardous waste generators and transporters and owners and operators of hazardous waste treatment, storage, and disposal facilities (TSDFs), as well as a permit program applicable to TSDFs.[58] All states except Alaska and Iowa administer their own hazardous waste management program for issuing permits and enforcing laws and regulations for hazardous waste facilities and practices.

Is Recycling of Plastic Products Regulated at the Federal Level?[59]

The federal government does not regulate recycling of plastics or administer a national recycling system. It does provide information and other resources to promote recycling. In the United States, states and local governments administer recycling programs for plastic and other solid wastes. At the federal level, EPA's role generally involves providing guidance and public information on plastic recycling.[60] For example, EPA has released a model recycling toolkit for states, local governments, nonprofits, and other organizations to create recycling programs and increase program participation.[61]

In 2021, EPA released its National Recycling Strategy.[62] In developing the strategy, EPA consulted with other federal agencies, sought stakeholder input, and invited public comment. The National Recycling Strategy includes objectives designed to expand recycling of MSW (including plastics, glass, metals, and paper) in the United States, and supports the National Recycling Goal to increase the recycling rate of all wastes to 50% by 2030. The five national objectives are (1) enhance the feasibility of commercial markets for commodities of recycled or recyclable materials; (2) increase collection and improve materials management infrastructure; (3) reduce contamination in the recycled materials stream; (4) enhance policies to support circularity; and (5) standardize measurement of recycled materials and increase data collection.[63] The National Recycling Strategy outlines options for policies, programs, and voluntary actions to be undertaken by federal agencies and other stakeholders such as local governments, recycling industries, and community groups. At the time the National Recycling Strategy was released, EPA indicated its intention to develop an implementation plan that will provide more detail on the activities and entities that could be involved in working to achieve the strategy's objectives.[64]

[56] Emma L. Teuten et al., "Transport and Release of Chemicals from Plastics to the Environment and to Wildlife," *Philos. Trans. R. Soc. Lond. B Biol. Sci.*, vol. 364, no. 1525 (July 27, 2009).

[57] 42 U.S.C. §6924(d).

[58] 42 U.S.C. §§6921-6939g.

[59] Angela C. Jones, Analyst in Environmental Policy, authored this section.

[60] See, for example, recycling information at EPA, "How Do I Recycle Common Recyclables," https://www.epa.gov/recycle/how-do-i-recycle-common-recyclables#pla and https://www.epa.gov/trash-free-waters/frequently-asked-questions-about-plastic-recycling-and-composting.

[61] EPA, "Model Recycling Program Toolkit," https://www.epa.gov/circulareconomy/model-recycling-program-toolkit.

[62] EPA, *National Recycling Strategy: Part One of a Series on Building a Circular Economy for All*, EPA-530-R-21-003, https://www.epa.gov/system/files/documents/2021-11/final-national-recycling-strategy.pdf (hereinafter EPA, *National Recycling Strategy*).

[63] EPA, *National Recycling Strategy*.

[64] As of December 6, 2024, EPA had not released an implementation plan.

In November 2024, as directed by Congress in Section 301 of the Save Our Seas 2.0 Act (P.L. 116-224), EPA released the *National Strategy to Prevent Plastic Pollution*.[65] In the national strategy, EPA outlines options for federal, state, and local governments (and other stakeholders) to reduce plastic waste generation and improve the management of plastic waste. This could include reducing the production and consumption of single-use plastic products; increasing public understanding of plastic waste impacts and how to appropriately manage plastic products; supporting state, local, and tribal government waste management activities; and developing a national extended producer responsibility framework for plastic products, among other options.[66]

What Is Chemical (i.e., Advanced) Recycling?[67]

Chemical or advanced recycling is the chemical decomposition of plastic waste into its monomers and basic chemical building blocks.[68] These monomers and basic chemicals can be reused for polymerization to produce plastics or possibly as feedstock for the synthesis of other chemicals and fuels.[69] While traditional recycling involves mechanical processes like grinding and remolding plastic into new objects, chemical recycling processes plastic waste into plastic feedstocks, monomers, or purified polymers that can create new plastic with properties like virgin (or unused) resins. Plastic recyclers view chemical recycling as helping to advance circularity.[70]

While chemical recycling is not as sensitive to contaminants as mechanical recycling, it has a higher cost and produces other wastes, including air emissions (i.e., criteria and hazardous air pollutants).[71] Furthermore, the feedstocks produced from chemical recycling may contain impurities that hinder their use in the production of fuels.[72]

[65] EPA, National Strategy to Prevent Plastic Pollution.

[66] EPA, *National Strategy to Prevent Plastic Pollution*.

[67] Omar M. Hammad, Analyst in Environmental Policy, authored this section.

[68] Demetres Briassoulis, Anastasia Pikasi, and Miltiadis Hiskakis, "End-of-Waste Life: Inventory of Alternative End-of-Use Recirculation Routes of Bio-Based Plastics in the European Union Context," *Critical Reviews in Environmental Science and Technology*, vol. 49, issue 20 (2019), pp. 1835-1892 (hereinafter Briassoulis, "End-of-Waste Life"). The term *advanced recycling* is used synonymously by plastic recyclers to describe chemical recycling; see ACC, "Advanced Recycling," https://www.americanchemistry.com/better-policy-regulation/plastics/advanced-recycling.

[69] Briassoulis, "End-of-Waste Life." The term *polymerization* may be defined as "a process in which small molecules called monomers combine to produce a large network of molecules called a polymer." ScienceDirect, "Polymerization," https://www.sciencedirect.com/topics/engineering/polymerization.

[70] ACC, "Advanced Recycling Explainer," https://plasticmakers.org/wp-content/uploads/2022/07/Advanced-Recycling-Explainer-032023.pdf.

[71] Mechanical recycling is more sensitive to contamination because the process involves grinding and melting plastic waste, meaning contaminants such as food residues, labels, and other non-plastic materials will hinder the recycling process. For more information, see Briassoulis, "End-of-Waste Life." For a discussion on pyrolysis/combustion units and the processing of plastic waste, see EPA, "Other Solid Waste Incinerators (OSWI): New Source Performance Standards (NSPS) and Emission Guidelines (EG) for Existing Sources," https://www.epa.gov/stationary-sources-air-pollution/other-solid-waste-incinerators-oswi-new-source-performance (hereinafter EPA, "Other Solid Waste Incinerators"). For additional information regarding criteria and hazardous air pollutants, see EPA, "Managing Air Quality—Air Pollutant Types," https://www.epa.gov/air-quality-management-process/managing-air-quality-air-pollutant-types.

[72] See EPA, "EPA Proposes New Protections for Communities from Fuels Made Using Plastic Waste Based Feedstocks," https://www.epa.gov/chemicals-under-tsca/epa-proposes-new-protections-communities-fuels-made-using-plastic-waste-based.

Plastic Pollution and Environmental Impacts FAQs

How Are Air Emissions from the Chemical Recycling of Plastics Regulated Under the Clean Air Act?[73]

As discussed above, chemical recycling of plastics can release emissions, contributing to air pollution. EPA regulates chemical recycling under the Clean Air Act (CAA) primarily by classifying certain chemical recycling processes, such as pyrolysis and gasification, as incineration.[74] According to EPA, *pyrolysis* is a thermal process where materials are decomposed at high temperatures "with extremely little to no" oxygen, producing a mix of solid, liquid, and gaseous products. *Gasification* is a similar process that uses a limited amount of oxygen to primarily generate a combustible gas called syngas, transforming plastic waste into usable energy sources like fuels or chemical commodities.[75] Pyrolysis and gasification units are used for chemical recycling and "are used to convert solid or semi-solid feedstocks—including solid waste, biomass, plastics, tires, and organic contaminants in soils and oily sludges—to useful products such as energy, fuels and chemical commodities," according to EPA.[76]

The CAA seeks to protect human health and the environment from emissions that pollute ambient, or outdoor, air. The CAA requires EPA to establish minimum national standards for air quality, and assigns primary responsibility to the states to assure compliance with national standards.[77] The CAA requires EPA to establish performance standards for categories of sources, including "for each category of solid waste incineration units," that cause, or contribute significantly to, air pollution that may reasonably be anticipated to endanger public health or welfare.[78] In 1993, EPA listed Other Solid Waste Incineration (OSWI) units as a category of solid waste incineration.[79] In 2005, EPA considered pyrolysis units, within the very small MSW incinerator and institutional waste incinerator subcategories, as covered units under their OSWI Rule.[80] In 2020, EPA proposed to modify the definitions in the OSWI standards to remove reference to "pyrolysis/combustion units."[81] EPA later withdrew the proposal in 2023, noting adverse

[73] Omar M. Hammad, Analyst in Environmental Policy, authored this section.

[74] The Clean Air Act (CAA), codified at 42 U.S.C. §§7401 et seq. EPA's definition of a *municipal waste combustion unit* includes "pyrolysis/combustion units" and the definition of *other solid waste incinerator (OSWI)* includes very small municipal waste combustion units; 40 C.F.R. §60.2977.

[75] EPA, "Potential Future Regulation Addressing Pyrolysis and Gasification Units," 86 *Federal Register* 50296, September 8, 2021.

[76] See EPA, "Advance Notice of Proposed Rulemaking on Pyrolysis and Gasification Units," https://www.epa.gov/stationary-sources-air-pollution/advance-notice-proposed-rulemaking-pyrolysis-and-gasification.

[77] For further information on the Clean Air Act, see CRS Report RL30853, *Clean Air Act: A Summary of the Act and Its Major Requirements*, by Richard K. Lattanzio.

[78] 42 U.S.C. §7429. For further information on new source performance standards, see EPA, "Demonstrating Compliance with New Source Performance Standards and State Implementation Plans," https://www.epa.gov/compliance/demonstrating-compliance-new-source-performance-standards-and-state-implementation-plans.

[79] See EPA, "Other Solid Waste Incinerators."

[80] EPA notes, "Some of these types of units may well be covered under the CAA section 129 final OSWI rules. For example, pyrolysis/combustion units (two chamber incinerators with a starved air primary chamber followed by an afterburner to complete combustion) within the VSMWC and IWI subcategories are considered OSWI units." See EPA, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Other Solid Waste Incineration Units," 70 *Federal Register* 74876, December 16, 2005.

[81] See EPA, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Other Solid Waste Incineration Units Review," 85 *Federal Register* 54178, August 31, 2020.

comments received on the proposal and "ongoing questions about the regulation of pyrolysis/combustion units."[82]

What Recent Actions Have EPA and Congress Taken Regarding Chemical Recycling Air Emissions?[83]

On September 8, 2021, EPA issued an advance notice of proposed rulemaking (ANPRM) as a means to gain a comprehensive understanding of the emissions from chemical recycling units. EPA plans to use this information to help determine if future CAA regulations or changes to existing regulations are warranted.[84] EPA received over 170 comments on the notice and had several discussions with stakeholders during the comment period.[85] In 2023, EPA noted that

> based on discussions with stakeholders and our review of the comments on the ANPRM and OSWI proposal as well as current scientific literature on the topic it is evident that pyrolysis is a complex process that is starting to be used in many and varied industries. The EPA will need significant time and personnel resources to fully analyze the comments and evaluate all current information sources to gain a technical and regulatory understanding of the pyrolysis process.[86]

On July 14, 2022, 35 Members of Congress sent a bicameral letter to EPA expressing their "concern over recent investments in chemical recycling as a means to manage our growing plastic pollution crisis."[87] In the letter, they urged EPA to obtain information on emissions from chemical recycling facilities, noting that "communities located near these facilities need to know what chemicals they are being exposed to."[88]

What Are the Greenhouse Gas Emissions from the Plastics Lifecycle?[89]

Greenhouse gases (GHGs) are emitted throughout the plastics lifecycle. Fossil fuels are used in the production of plastic, and the extraction and transport of these fuels for this purpose produces GHG emissions.[90] The refining and manufacture of plastics is energy intensive and also results in the emissions

[82] See EPA, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Other Solid Waste Incineration Units Review; Withdrawal of Proposed Provision Removing Pyrolysis/Combustion Units," 88 *Federal Register* 36524, June 5, 2023. The current OSWI regulations are listed in 40 C.F.R. Part 60 Subpart EEEE for the standards of performance for new OSWI units and 40 C.F.R. Part 60 Subpart FFFF for emissions guidelines for existing OSWI units.

[83] Omar M. Hammad, Analyst in Environmental Policy, authored this section.

[84] See EPA, "Potential Future Regulation Addressing Pyrolysis and Gasification Units," 86 *Federal Register* 50296, September 8, 2021.

[85] See EPA, "Advance Notice of Proposed Rulemaking on Pyrolysis and Gasification Units," https://www.epa.gov/stationary-sources-air-pollution/advance-notice-proposed-rulemaking-pyrolysis-and-gasification.

[86] See EPA, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Other Solid Waste Incineration Units Review; Withdrawal of Proposed Provision Removing Pyrolysis/Combustion Units," 88 *Federal Register* 36524, June 5, 2023.

[87] Letter from 35 Members of Congress to The Honorable Michael S. Regan, EPA Administrator, 2022, https://www.booker.senate.gov/imo/media/doc/booker_huffman_lowenthal_lead_35_colleagues_in_letter_raising_concerns_over_climate__environmental_justice_risks_of_chemical_recycling_of_plastics1.pdf (hereinafter Letter from 35 Members of Congress to The Honorable Michael S. Regan, EPA Administrator, 2022).

[88] Letter from 35 Members of Congress to The Honorable Michael S. Regan, EPA Administrator, 2022. Congress also introduced a bill that would define *advanced recycling* as a manufacturing process and not as a waste management or incineration process. Accelerating a Circular Economy for Plastics and Recycling Innovation Act of 2024, H.R. 9676, 118th Congress (2024).

[89] Jonathan D. Haskett, Analyst in Environmental Policy, authored this section.

[90] Center for International Environmental Law (CIEL), *Plastic & Climate: The Hidden Costs of a Plastic Planet*, 2019, https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf (hereinafter CIEL, *Plastic & Climate*). OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, p. 36.

of GHGs.[91] The management of plastic waste through recycling, incineration, and landfilling produces emissions of GHGs as well.[92]

OECD estimated that GHG emissions from the global plastic lifecycle in 2019 (the most recent year included in the OECD report) were approximately 2 gigatons of carbon dioxide equivalent (CO_2e), approximately 4% of global GHG emissions for that year.[93] Approximately 90% of these plastic lifecycle emissions are attributable to the production and conversion of fossil fuels into plastic products.[94] The waste management stage of the plastic lifecycle generated about 10% of the lifecycle emissions, with incineration accounting for more than 70% of the waste management contribution.[95] OECD projects that by 2060, global plastic lifecycle emissions may more than double in a baseline scenario, which models the environmental effects of continuing current policies (those implemented as of 2019) on plastics and waste management.[96]

What Are the Sources of Freshwater and Marine Plastic Pollution?[97]

Plastics can leak into the environment across the plastic lifecycle, from a variety of sources during the production, manufacturing, use, and post-use disposal phases, leading to plastic pollution. *Macroplastics*, which are plastics with a diameter of 5 millimeters or more, leak almost entirely from mismanaged waste, including litter.[98] This waste can make its way to waterways via wind or stormwater from rainfall carrying it through storm drains, streams, canals, and rivers.[99] Streams and rivers can ultimately carry these plastics to the ocean. Additionally, plastic waste may be intentionally or unintentionally disposed of directly into fresh waterbodies or the ocean, both along shorelines or via vessels.[100]

Microplastics are plastic particles with a diameter of less than 5 millimeters, including *nanoplastics*, which are less than 1 micrometer (i.e., cannot be seen by the human eye).[101] Microplastics may be categorized as either primary or secondary microplastics. *Primary microplastics* are manufactured intentionally to be small, such as the pre-production plastic pellets that are melted and used to create plastic products.[102] These primary microplastics can be a source of leakage when they spill during transportation or are carried by stormwater runoff from facilities that produce them. In addition,

[91] CIEL, *Plastic & Climate*.

[92] CIEL, *Plastic & Climate*.

[93] OECD, *Global Plastics Outlook: Policy Scenarios to 2060*, 2022, pp. 134-135, https://www.oecd.org/en/publications/global-plastics-outlook_aa1edf33-en.html. Carbon dioxide equivalents account for the different warming impacts of different GHGs. The influence of GHGs on global temperatures arises from the combined effect of carbon dioxide (CO_2) and the other non-CO_2 GHGs. The combined influence of all GHGs may be determined by normalizing the global warming potentials of the GHGs to the global warming potential of CO_2. This results in a metric of carbon dioxide equivalent (CO_2e) to compare across GHGs.

[94] OECD, *Global Plastics Outlook: Policy Scenarios to 2060*, pp. 134-135.

[95] OECD, *Global Plastics Outlook: Policy Scenarios to 2060*, pp. 134-135.

[96] OECD, *Global Plastics Outlook: Policy Scenarios to 2060*, pp. 17, 24, 43, 134-135.

[97] Laura Gatz, Specialist in Environmental Policy, authored this section.

[98] OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, p. 21.

[99] EPA, "Trash Free Waters: Learn About Aquatic Trash," https://www.epa.gov/trash-free-waters/learn-about-aquatic-trash (hereinafter EPA, "Trash Free Waters: Learn About Aquatic Trash").

[100] EPA, "Trash Free Waters: Learn About Aquatic Trash." See also National Oceanic and Atmospheric Administration (NOAA), "Marine Debris Program: Where Does Marine Debris Come From?" https://marinedebris.noaa.gov/discover-marine-debris/where-does-marine-debris-come.

[101] EPA, "Microplastics Research," https://www.epa.gov/water-research/microplastics-research. See also NOAA, "Marine Debris Program: Microplastics," https://marinedebris.noaa.gov/what-marine-debris/microplastics.

[102] Microbeads in personal care products are another example of primary microplastics. In December 2015, Congress passed the Microbead-Free Waters Act (P.L. 114-114) to ban the manufacture, packaging, and distribution of rinse-off cosmetic products that contain plastic microbeads in the United States.

macroplastics may degrade or break down over time, for example, by sun, heat, wind, and waves, to form *secondary microplastics*.[103] Secondary microplastics in waterways may come from a variety of sources, such as degradation of mismanaged plastic, tire abrasion on roads, or microfibers shed from synthetic clothing during laundering. These secondary microplastics may reach both freshwater and marine waterways via diverse pathways including wind, treated wastewater effluent, wastewater sludge, and stormwater runoff.

Both macroplastics and microplastics pose risks to the environment, including in freshwater and marine ecosystems. Some of the impacts of concern include wildlife ingesting plastic or becoming entangled in plastic waste, which can lead to suffocation or starvation. Microplastics are also persistent and may accumulate in the environment—such as in deep ocean sediments, water columns of oceans and lakes, soils, or the atmosphere—and in organisms (both humans and wildlife).

What Is Marine Debris?[104]

Congress has defined *marine debris*, also known as *marine litter* and *anthropogenic 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."[105] Marine debris can be made of plastic, glass, metal, or wood. According to the National Oceanic and Atmospheric Administration (NOAA), plastic is the most abundant type of marine debris in shoreline and oceanic surveys in the United States.[106] Plastic debris comes in a variety of sizes and types, ranging from microplastics to macroplastics, such as food wrappers, bottles, bags, foam materials, and fishing gear. Congress has directed NOAA or the Secretary of Commerce (through NOAA) to lead federal government efforts to address marine debris and has enacted additional marine-debris-related legislation in recent years. (See "What Federal Laws Provide Agencies the Authority to Address Marine Debris, Including Plastic Pollution?")

How Is Plastic Pollution Regulated Under the Clean Water Act?[107]

The Clean Water Act (CWA) is the principal federal statute governing pollution of the nation's surface waters.[108] EPA and states jointly administer and enforce aspects of the statute through its cooperative federalism framework. The CWA regulates discharges of pollutants into waters of the United States. Among the statute's mechanisms that may be used to address plastic pollution are water quality standards, a permitting program for wastewater and stormwater point source discharges (i.e., the National Pollutant Discharge Elimination System, or NPDES permitting program), and a nonpoint source management program for more diffuse sources of pollution.[109] The statute also has established nonregulatory place-based restoration programs, including the National Estuary Program and a number of CWA Geographic Programs, such as the Great Lakes Restoration Initiative and Chesapeake Bay Program.[110] These place-based programs encompass broader collaborative efforts (among federal, state, local, and nongovernmental entities) to improve some of the nation's aquatic resources that Congress, EPA, and

[103] NOAA, "Marine Debris Program: Microplastics," https://marinedebris.noaa.gov/what-marine-debris/microplastics.

[104] Eva Lipiec, Specialist in Natural Resource Policy, authored this section. For more information, see CRS In Focus IF10967, *Marine Debris: NOAA's Role*, by Eva Lipiec.

[105] 33 U.S.C. §1956.

[106] NOAA, "Marine Debris Program: Plastic," https://marinedebris.noaa.gov/what-marine-debris/plastic.

[107] Laura Gatz, Specialist in Environmental Policy, authored this section.

[108] 33 U.S.C. §§1251 et seq.

[109] 33 U.S.C. §§1311, 1313, 1329, and 1342.

[110] 33 U.S.C. §§1267-1270, 1273, 1275, 1276a, 1276b, 1330.

states have identified as economically and ecologically valuable.[111] Place-based programs may address a wide variety of water quality concerns, including plastic pollution. EPA and states may use some of their authorities under the CWA to address trash (including macroplastics) as well as microplastics.

Trash and Macroplastics

EPA and states may use some of the CWA's regulatory tools to address trash, including macroplastics. Some states have established water quality standards for trash, and have listed waterbodies as *impaired* (i.e., not meeting water quality standards) for trash.[112] Under the CWA, states are required to establish a *Total Maximum Daily Load* (*TMDL*), which is essentially a pollution budget, or take other measures to address impaired waters and the sources of pollutants.[113] According to EPA, a few states have established trash TMDLs for waterbodies within those states.[114]

Under the CWA, National Pollutant Discharge Elimination System (NPDES) stormwater permits also may be used to set standards to limit the amount of trash from stormwater outfalls into receiving waterbodies, such as rivers and streams. The statute does not require the use of these regulatory mechanisms, but they are available as a tool to help address trash and plastic. In 2021, EPA published a compendium as a resource for NPDES stormwater permit writers to provide tools and information that can be used in developing trash-related provisions for stormwater permits.[115] The compendium includes examples from 21 existing stormwater permits from across the nation that include trash-related provisions.

States may also manage trash and plastics from nonpoint sources of pollution through their state nonpoint source management programs, which receive federal grant funding through the CWA Section 319 Grant program.[116]

Microplastics

EPA and states also may use available CWA authorities to address microplastic in waters of the United States.[117] The CWA requires EPA to publish national technology-based regulations for industrial dischargers called Effluent Limitation Guidelines and Standards (ELGs), which set minimum standards

[111] EPA, "Estuaries and National Estuary Program," https://www.epa.gov/nep; and EPA, "Geographic Programs," https://www.epa.gov/water-infrastructure/geographic-programs.

[112] According to EPA's Office of Inspector General, between 1996 and 2021, 320 individual waterbody segments in 10 states and the District of Columbia were listed as *impaired* for trash, debris, or floatables. EPA Office of Inspector General, *EPA Helps States Reduce Trash, Including Plastic, in U.S. Waterways but Needs to Identify Obstacles and Develop Strategies for Further Progress*, Report No. 21-P-0130, May 11, 2021, p. 6, https://www.epa.gov/sites/default/files/2021-05/documents/_epaoig_20210511-21-p-0130.pdf (hereinafter EPA OIG, *EPA Helps States Reduce Trash*). Once a waterbody is listed as impaired for a pollutant, the waterbody remains listed until the state delists it in accordance with CWA regulations, subject to EPA approval. See 40 C.F.R. §130.7.

[113] 33 U.S.C. §1313(d).

[114] EPA OIG, *EPA Helps States Reduce Trash*. Alaska, California, Maryland, and the District of Columbia have established Total Maximum Daily Loads (TMDLs) for trash.

[115] EPA, *Trash Stormwater Permit Compendium*, EPA-841-R-21-001, April 2021, https://www.epa.gov/system/files/documents/2021-09/ms4_trash_compendium_april-2021-with-pub-number_0.pdf.

[116] EPA, "319 Grant Program for States and Territories," https://www.epa.gov/nps/319-grant-program-states-and-territories. See, for example, "Nonpoint Source Success Story: District of Columbia, Stream Restoration and Trash Removal Efforts Improve Nash Run," https://www.epa.gov/sites/default/files/2019-12/documents/dc_nash_run_1684_508.pdf.

[117] For further information on Clean Water Act (CWA) authorities available to address emerging contaminants, such as microplastics, see CRS Report R45998, *Contaminants of Emerging Concern Under the Clean Water Act*, by Laura Gatz. States may also use their own state authorities to protect additional waters that do not fall under the federal jurisdictional scope of the CWA.

for specific pollutants in industrial wastewater discharges.[118] EPA or states incorporate these limits into the NPDES permits. The CWA also requires EPA to develop and publish water quality criteria for surface water, which are recommendations to states for use in developing their state water quality standards.[119] States use these water quality standards to protect and restore their waters and to inform water-quality-based effluent limits in NPDES permits. EPA and states may also include technology-based limits or water-quality-based limits in NPDES permits on a case-by-case basis even when EPA has not established ELGs and/or water quality criteria for a given pollutant.

To date, EPA has not established ELGs or water quality criteria for microplastics. As is often the case with emerging contaminants like microplastics, EPA faces some challenges in establishing such ELGs or criteria. One of the key challenges for microplastics is a lack of available standardized analytical methods that are reliable, reproducible, and representative to extract, characterize, and quantify microplastics (and nanoplastics).[120] The lack of such standardized analytical methods also limits the data available to characterize exposure and impacts of microplastics to both aquatic life and human health.

EPA convened an expert workshop in 2017 to identify and prioritize the scientific information needed to understand the risks posed by microplastics.[121] In 2021, EPA published an update on these priority microplastics research needs.[122] The update's findings indicated that each of the priority research topics identified by the 2017 workshop remained relevant.[123] These research topics include analytical methods; sources, transport, and fate; environmental assessments; and human health assessments. The EPA Office of Research and Development's Strategic Research Action Plan (StRAP) for FY2023-2026 for the Safe and Sustainable Water Resources Research Program identifies microplastics as a priority research area for protecting and restoring water resources.[124] Specifically, the StRAP states that "research is needed to address knowledge gaps on the growing concern of microplastic pollution, including research advancing methodologies, models, and tools to elucidate exposure and impacts of microplastics on human health and aquatic resources."[125]

EPA has taken steps to address pre-production microplastic under its NPDES stormwater permit program. Specifically, EPA's multisector general permit for industrial stormwater discharges includes requirements for facilities that handle pre-production microplastics to implement control measures to reduce and eliminate discharges of plastic material in stormwater.[126]

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[118] 33 U.S.C. §§1314(b), 1316(b), 1317(b)-(c). EPA issues ELGs for categories of industrial dischargers. Since 1972, EPA has promulgated ELGs for 59 industrial categories.

[119] 33 U.S.C. §1314(a)(1).

[120] EPA, "Advanced Ambient Water Quality Research," https://www.epa.gov/water-research/advanced-ambient-water-quality-research#Environmental%20Health%20Effects%20of%20Microplastics.

[121] EPA Office of Wetlands, Oceans, and Watersheds, *Microplastics Expert Workshop Report*, December 2017, https://www.epa.gov/sites/default/files/2018-03/documents/microplastics_expert_workshop_report_final_12-4-17.pdf.

[122] EPA Office of Wetlands, Oceans, and Watersheds, *A Trash Free Waters Report on Priority Microplastics Research Needs: Update to the 2017 Microplastics Expert Workshop*, EPA-842-R-21-005, December 2021, https://www.epa.gov/system/files/documents/2021-12/tfw-report-on-priority-microplastics-research-needs_0.pdf (hereinafter EPA, *A Trash Free Waters Report on Priority Microplastics Research Needs*).

[123] EPA, *A Trash Free Waters Report on Priority Microplastics Research Needs*, pp. 1-2.

[124] EPA, Office of Research and Development, *Safe and Sustainable Water Resources: Strategic Research Action Plan, Fiscal Years 2023-2026*, EPA/600/R-22/242, October 2022, pp. 6-8, https://www.epa.gov/system/files/documents/2022-10/SSWR%20FY23-26%20StRAP_EPA-ORD_October%202022_508.pdf (hereinafter EPA, ORD *Safe and Sustainable Water Resources: Strategic Research Action Plan, Fiscal Years 2023-2026*).

[125] EPA, ORD *Safe and Sustainable Water Resources: Strategic Research Action Plan, Fiscal Years 2023-2026.*

[126] EPA, *NPDES Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity Fact Sheet*, 2021, p. 39, https://www.epa.gov/sites/default/files/2021-01/documents/2021_msgp_-_fact_sheet.pdf.

What Federal Laws Provide Agencies the Authority to Address Marine Debris, Including Plastic Pollution?[127]

In 2006, Congress passed the Marine Debris Research, Prevention, and Reduction Act (P.L. 109-449).[128] Congress amended the act through the Marine Debris Act Amendments of 2012 (P.L. 112-213, Title VI) and renamed it the Marine Debris Act. Since then, the act has been amended three additional times.[129] Congress most recently enacted the Save Our Seas 2.0 Act (SOS 2.0 Act), which amended the Marine Debris Act and mandated several activities across federal agencies.

Marine Debris Act

The purpose of the Marine Debris Act is to "address the adverse impacts of marine debris on the [U.S.] economy, the marine environment…, and navigation safety through the identification, determination of sources, assessment, prevention, reduction, and removal of marine debris."[130] The law is primarily administered by NOAA, as well as by the U.S. Coast Guard. The law established the Marine Debris Program at 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, the marine environment, and navigation safety."[131] According to NOAA, the Marine Debris Program achieves its mission through five main pillars: removal, prevention, research, regional coordination, and emergency response.[132]

The Marine Debris Act also established the Interagency Marine Debris Coordinating Committee (IMDCC) with senior officials from at least six federal departments and agencies.[133] The IMDCC was established to coordinate marine debris research and activities across the federal government in cooperation and coordination with nonfederal entities.[134]

Save Our Seas 2.0 Act

Congress passed the SOS 2.0 Act in 2020, a successor to the Save Our Seas Act of 2018 (SOS Act of 2018; P.L. 115-265). In addition to amending the Marine Debris Act, the SOS 2.0 Act mandated activities across several federal agencies. These activities include

- establishing the Marine Debris Foundation;[135]
- developing the Genius Prize for Save Our Seas Innovations administered by the Secretary of Commerce;[136]

[127] Eva Lipiec, Specialist in Natural Resource Policy, authored this section.

[128] 33 U.S.C. §§1951 et seq.

[129] Since 2012, the Marine Debris Act has been amended by the Save Our Seas Act of 2018 (SOS Act of 2018; P.L. 115-265), the Save Our Seas 2.0 Act (SOS 2.0 Act; P.L. 116-224) in 2020, and the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023 (P.L. 117-263, §11328).

[130] 33 U.S.C. §1951.

[131] 33 U.S.C. §1952(a). For more information about the Marine Debris Program, see NOAA, "Marine Debris Program," https://marinedebris.noaa.gov/.

[132] NOAA, *NOAA Marine Debris Program Fact Sheet*, https://marinedebris.noaa.gov/fact-sheets/noaa-marine-debris-program-fact-sheet.

[133] 33 U.S.C. §1954. The committee includes senior officials from NOAA (who also serves as the chairperson of the committee), EPA, U.S. Coast Guard, U.S. Navy, Department of State, Department of the Interior, and other relevant agencies.

[134] 33 U.S.C. §1954(a).

[135] 33 U.S.C. §§4211 et seq.

[136] 33 U.S.C. §§4231 et seq.

- directing the IMDCC, Under Secretary of Commerce, National Institute of Standards and Technology (NIST), EPA Administrator, and Secretary of Transportation, in some cases individually and others jointly, to complete a series of reports on plastic pollution, recycling, reuse, and waste management;[137]
- setting U.S. policy on international cooperation to "combat" marine debris;[138] and
- authorizing the EPA Administrator to provide grants for domestic post-consumer materials management; for improvements to reduce and remove plastic and post-consumer materials from drinking water, drinking water sources, and wastewater; and for "trash-free waters" projects that address solid waste and post-consumer materials in waterways.[139]

For a list of reports required by Congress under the SOS 2.0 Act, see **Table A-1**.

How Does the Toxic Substances Control Act Apply to Chemicals Associated with Plastics Production and Use?[140]

Title I of the Toxic Substances Control Act (TSCA) authorizes EPA to gather information on a broad universe of industrial and commercial chemicals, including those generally associated with plastics production and use.[141] Title I of TSCA directs EPA to use the information that the agency has gathered to evaluate chemicals for *unreasonable* risks of injury to human health or the environment that may warrant regulating any part of a chemical's lifecycle (i.e., manufacture, importation, processing, distribution, use, and disposal) to eliminate such risks.[142]

Polymers, such as PET and PVC, are the chemical substances that predominantly make up plastic products by volume and mass.[143] Polymers are generally understood to present a lower risk to human health and the environment than other chemicals due to their relatively high molecular weight and size.[144] Based on these characteristics, polymers are unlikely to react biologically or are inert (i.e., chemically inactive). For this reason, under Title I of TSCA, EPA generally has focused its attention on gathering information and determining whether regulation may be warranted for chemicals understood to have relatively greater risk than polymers, such as chemicals used to produce polymers (e.g., 1,2-dichloroethane, vinyl chloride) and other chemicals that may be intentionally added to plastics (e.g., plasticizers, flame retardants, pigments) to obtain certain desired properties.[145] EPA also has identified

[137] Not codified in the *U.S. Code*. See P.L. 116-224, §§131-136 and 303-307.

[138] 33 U.S.C. §4261.

[139] 33 U.S.C. §4282.

[140] Jerry H. Yen, Analyst in Environmental Policy, authored this section.

[141] 15 U.S.C. §§2601 et seq. For more information on Title I of the Toxic Substances Control Act (TSCA), see CRS Report R45149, *Title I of the Toxic Substances Control Act (TSCA): A Summary of the Statute*, by Jerry H. Yen and Kate R. Bowers.

[142] 15 U.S.C. §§2604 and 2605.

[143] UNEP and Secretariat of the Basel, Rotterdam, and Stockholm Conventions, *Chemicals in Plastics: A Technical Report* (Geneva, Switzerland: UNEP, 2023), p. 6.

[144] See EPA, "Premanufacture Notification Exemptions; Exemptions for Polymers," 49 *Federal Register* 46066-46091, November 21, 1984, for the agency's discussion on exempting polymers from new chemical notification requirements based on multiple factors, including relative molecular weight.

[145] In December 2019, EPA designated, among other chemicals, 1,2-dichloroethane as high-priority for risk evaluation under TSCA. See EPA, "High-Priority Substance Designations Under the Toxic Substances Control Act (TSCA) and Initiation of Risk Evaluation on High-Priority Substances; Notice of Availability," 84 *Federal Register* 71924-71935, December 30, 2019. In July 2024, EPA proposed to designate five chemicals, including vinyl chloride, as high-priority for risk evaluation under TSCA. See EPA, "Proposed High-Priority Substance Designations Under the Toxic Substances Control Act (TSCA); Notice of Availability," (continued...)

specific polymer characteristics that would warrant scrutiny if a manufacturer sought to introduce into commerce a polymer with such characteristics.[146] In addition, EPA has more recently evaluated risks associated with pyrolysis products of plastic wastes.[147] Industry has referred to this process as a form of *advanced recycling* or *chemical recycling* due to the potential for using these pyrolysis products for making plastic products (see "What Is Chemical (i.e., Advanced) Recycling?").

EPA has promulgated regulations under Title I of TSCA to prohibit or restrict the manufacture, processing, distribution, use, or disposal of certain existing chemicals associated with plastics production.[148] EPA also has promulgated regulations that require notification to the agency for instances in which a manufacturer wishes to reintroduce certain chemicals that have been phased out from plastics production back into commerce.[149] Notification provides EPA the opportunity to evaluate the proposed reintroduction of such chemicals to determine whether regulatory action to prohibit or restrict the manufacture, processing, distribution, use, or disposal of that particular chemical may be warranted. For example, EPA promulgated such a notification requirement for di-n-pentyl phthalate, which previously was used in the production of PVC.[150] If EPA finds that existing information is insufficient to evaluate the risks associated with particular chemicals, Title I of TSCA authorizes EPA to promulgate rules or issue orders requiring manufacturers and processors to generate and submit specific information deemed necessary to evaluate the risks associated with such chemicals.[151] For chemicals that EPA has prioritized for risk evaluation, including certain chemicals associated with plastics production, the agency generally has issued orders to require additional testing.[152]

With respect to international trade, regulations promulgated under Title I of TSCA to restrict a chemical also apply to the importation of that chemical.[153] The U.S. Customs and Border Protection, an agency of the U.S. Department of Homeland Security, works with EPA to ensure that chemical imports into the United States comply with these regulations. For exports, any person who exports or intends to export a chemical subject to certain TSCA regulations is required to notify EPA, which, in turn, is directed to provide notice about the export activity and associated EPA regulations to the government of the country receiving the export.[154] Under Title I of TSCA, a manufacturer may produce and export a chemical that has been prohibited in the United States to another country if the chemical is clearly labeled for export and notification requirements to the other country have been met.[155]

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89 *Federal Register* 60420-60424, July 25, 2024. For a list of chemical substances that EPA has designated as high-priority for risk evaluation under TSCA, see EPA, "Ongoing and Completed Chemical Risk Evaluations under TSCA," accessed November 25, 2024, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/ongoing-and-completed-chemical-risk-evaluations-under.

[146] 40 C.F.R. §723.250.

[147] See, for example, EPA, "EPA Proposes New Protections for Communities from Fuels Made Using Plastic Waste Based Feedstocks," press release, June 15, 2023, https://www.epa.gov/chemicals-under-tsca/epa-proposes-new-protections-communities-fuels-made-using-plastic-waste-based.

[148] For example, see 40 C.F.R. Part 761 for the regulation of polychlorinated biphenyls (PCBs), 40 C.F.R. §751.405 for the regulation of decabromodiphenyl ether (decaBDE), and 40 C.F.R. §751.407 for the regulation of phenol, isopropylated phosphate (3:1).

[149] TSCA Section 5 (15 U.S.C. §2604) generally authorizes EPA to promulgate significant new use rules (SNURs) that require notification to the agency for instances in which a manufacturer wishes to reintroduce a chemical that has been phased out back into commerce.

[150] 40 C.F.R. §721.10226.

[151] 15 U.S.C. §2603(a).

[152] See EPA, "List of Chemicals Subject to Section 4 Test Orders," https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/list-chemicals-subject-section-4-test-orders.

[153] 15 U.S.C. §2612.

[154] 15 U.S.C. §2611.

[155] 15 U.S.C. §2611.

To prevent duplication, the scope of Title I of TSCA does not extend to chemicals that have specific uses governed by certain other federal statutes. For example, plastics in food packaging, cosmetics, and medical devices are regulated by the Federal Food, Drug, and Cosmetic Act, as amended.[156] Pesticidal devices made of plastics are covered by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).[157] While Title I of TSCA is intended to address risks associated with the lifecycle of chemical substances, other federal environmental statutes focus on risks associated with the release of substances into the environment as pollution. Title I of TSCA also complements other federal statutes that involve reducing risks from exposure to chemicals in specific contexts, including but not limited to occupational settings and consumer products. Title I of TSCA expressly provides that other federal laws supersede EPA's authority to use TSCA to address unreasonable risks. For instance, if EPA determines that a chemical substance presents an unreasonable risk that may sufficiently be prevented or reduced by actions taken under other federal laws, the agency may only take action under TSCA in limited circumstances.[158]

What Factors Are Relevant in Assessing the Potential Health and Environmental Risks Associated with Plastics to Inform Regulatory or Nonregulatory Actions?[159]

Determining whether certain regulatory or nonregulatory actions may be warranted under various federal pollution control statutes generally involves the consideration of multiple factors, such as the extent to which human health and/or environmental risks associated with specific chemicals, including those used to produce, or present in, plastics, may in part justify taking such actions on such chemicals.[160] Although each pollution control statute generally provides parameters within which the finding of particular risks requires or authorizes taking certain actions, evaluating such risks may be challenging due to the potential complexity of ever-increasing scientific information to review and in some cases insufficient information to make a well-informed judgment on risks. Ultimately, the consideration of risks is an exercise of determining what risks are acceptable and do not warrant further action versus what risks are unacceptable and may warrant taking requisite regulatory or nonregulatory action.[161]

Potential human health and environmental risks of plastics vary depending on the properties of the specific chemicals that are used to manufacture plastics or are present in plastic products and wastes, and the potential for exposures by those who may come into contact with such chemicals. Potential effects from exposure may differ widely among chemicals that share similar but not identical properties. Proximity to a chemical is not necessarily a sole indicator of potential health or environmental risks, because the risks depend on the extent to which particular exposures to a chemical may directly or indirectly affect the human body or the bodies of other animals and plants, through specific physiological systems.

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[156] 21 U.S.C. §§301 et seq.

[157] 7 U.S.C. §§136 et seq. Specifically, FIFRA Section 2(h) (7 U.S.C. §136(h)) defines the term *device* as "any instrument or contrivance (other than a firearm) which is intended for trapping, destroying, repelling, or mitigating any pest or any other form of plant or animal life (other than man and other than bacteria, virus, or other microorganism on or in living man or other living animals); but not including equipment used for the application of pesticides when sold separately therefrom." Examples include UV light units; air purifiers and filters; hypochlorous acid generators; water purifiers; insect traps; gopher and rodent control systems; sound, airwave, or vibration generators; and gamma irradiation units that are associated with claims of controlling or repelling particular pests.

[158] 15 U.S.C. §2608.

[159] Jerry H. Yen, Analyst in Environmental Policy, authored this section.

[160] For more information, see EPA, "Risk Management," April 30, 2024, https://www.epa.gov/risk/risk-management.

[161] For more information, see EPA, *Risk Characterization Handbook*, EPA 100-B-00-002, December 2000, https://www.epa.gov/sites/default/files/2015-10/documents/osp_risk_characterization_handbook_2000.pdf.

Generally, the potential risks to any individual organism exposed to a specific chemical would depend on a combination of multiple factors, including

- properties of the chemical;
- frequency, concentration, and duration of exposure (i.e., the dose);
- pathway of exposure (e.g., inhalation, ingestion, or skin contact);
- interaction with other chemicals that may be present in the environment; and
- age, overall health, and genetic and behavioral characteristics of the individual organism, including individual human beings, at the time of exposure.[162]

Because of the variability among these factors, individuals exposed to the same chemical may experience differing effects, making it difficult to demonstrate a causal link between exposures and specific effects at the population level. There may be additional uncertainty about causation if the effects observed among a population may be associated with multiple causes, of which chemical exposures may be one of many.

Assessing the ecological risks of a chemical involves additional challenges compared to assessing human health risks given the number of species to consider and the potentially unique health effects for different species that may vary depending on their habitats or surrounding environment.[163] The extent to which adverse effects on individuals of a particular species may affect an ecosystem in a way that warrants taking regulatory or nonregulatory action is a complex issue from a scientific and policy standpoint.

Research FAQs

What Types of Research Are Federal Agencies Conducting on Plastics?[164]

Agencies throughout the federal government contribute to research on plastics through several avenues, including conducting primary research and funding research through grant awards or cooperative agreements. This response focuses on what primary research federal agencies are conducting on plastics; funding programs for plastics research are not included here.

The federal agencies and research projects highlighted below are illustrative; this should not be considered a comprehensive overview of all federal research on plastics. The following reports provide more examples of the federal agencies engaging in plastic-related research:[165]

- Appendix A of *Mobilizing Federal Action on Plastic Pollution: Progress, Principles, and Priorities*;[166] and

[162] For additional information on risk assessment, see NASEM, *Science and Decisions: Advancing Risk Assessment* (Washington, D.C.: The National Academies Press, 2009), https://nap.nationalacademies.org/catalog/12209/science-and-decisions-advancing-risk-assessment.

[163] For more information, see EPA, "Ecological Risk Assessment," June 21, 2024, https://www.epa.gov/risk/ecological-risk-assessment.

[164] Claire M. Jordan, Senior Research Librarian, authored this section.

[165] Agencies highlighted in the reports as conducting primary plastic-related research include the U.S. Agency for International Development; U.S. Department of Agriculture (including the Agricultural Research Service); U.S. Department of Commerce (including NIST and NOAA); U.S. Department of Energy; U.S. Department of Health and Human Services (including the Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, and Food and Drug Administration); U.S. Department of the Interior (including the U.S. Geological Survey); and EPA. The reports also highlight examples of agencies that support plastic-related research.

[166] Interagency Policy Committee on Plastic Pollution and a Circular Economy (IPC), *Mobilizing Federal Action on Plastic*
(continued...)

- Appendix C of *National Recycling Strategy: Part One of a Series on Building a Circular Economy for All*[167]

Environmental Protection Agency

In 2013, EPA established the Trash Free Waters Program.[168] This nonregulatory program aims to prevent and remove aquatic trash, as well as improve the understanding of the sources, causes, pathways, and impacts of aquatic trash, including microplastics, through research.[169] For example, EPA researchers are collaborating to develop a national approach for extracting microplastics from aquatic sediment (i.e., the sediment found at the bottom of bodies of water) to help quantify the risks associated with exposure to such microplastics.[170] Other EPA programs conduct research on plastics as well, such as microplastics research within the Office of Research and Development's Safe and Sustainable Water Resources Research Program.[171]

National Institute of Standards and Technology

NIST researchers are collaborating with partners to reduce research and data gaps to improve lifecycle assessments (LCAs) for plastics.[172] This research is conducted through NIST's Circular Economy Program, which is focused on supporting the nation's transition from a linear economy (i.e., material extraction and disposal) to a circular economy.[173] NIST research on this topic is focused on three thematic areas: (1) data and decision tools (evaluating existing and developing new data and decision tools to help decisionmakers increase sustainability); (2) material science (improving the circularity of different materials); and (3) environmental impact assessment (assessing the environmental impacts of being circular rather than linear).[174]

National Oceanic and Atmospheric Administration

Through NOAA's Marine Debris Program (MDP), the agency funds and conducts research on the sources, movement, and impacts of marine debris.[175] In 2023, in partnership with the National Center for Ecological Analysis and Synthesis, MDP launched a study to develop a framework for estimating the social costs of plastic pollution. The working group conducting this study considers the "social costs" of

Pollution: Progress, Principles, and Priorities, July 2024, https://www.whitehouse.gov/wp-content/uploads/2024/07/Mobilizing-Federal-Action-on-Plastic-Pollution-Progress-Principles-and-Priorities-July-2024.pdf (hereinafter IPC, *Mobilizing Federal Action on Plastic Pollution*).

[167] EPA, *National Recycling Strategy: Part One of a Series on Building a Circular Economy for All*, November 15, 2021, https://www.epa.gov/system/files/documents/2021-11/final-national-recycling-strategy.pdf.

[168] EPA, "Trash Free Waters," https://www.epa.gov/trash-free-waters.

[169] EPA, "Trash Free Waters," https://www.epa.gov/trash-free-waters.

[170] EPA, Trash Free Waters, "Supporting the Development of a National Approach to Extracting Microplastics from Sediment," https://www.epa.gov/trash-free-waters/research-projects#sediment.

[171] EPA, Water Research, "Microplastics Research," https://www.epa.gov/water-research/microplastics-research; and EPA, ORD *Safe and Sustainable Water Resources: Strategic Research Action Plan, Fiscal Years 2023-2026*.

[172] NIST, "LCA of Polymers (Plastics) to Improve Circularity," https://www.nist.gov/el/applied-economics-office/lca-polymers-plastics-improve-circularity.

[173] NIST, "Circular Economy," https://www.nist.gov/circular-economy.

[174] NIST, "Research Areas," https://www.nist.gov/circular-economy/research-areas.

[175] NOAA, "Marine Debris Program," https://marinedebris.noaa.gov/; and NOAA, Marine Debris Program, "Research," https://marinedebris.noaa.gov/our-work/research.

plastic pollution to be the "dollar value of avoided plastic pollution."[176] The study is anticipated to conclude June 2025.[177]

Legislation FAQs

What Bills Have Been Introduced in the 118th Congress on Plastics?[178]

During the 118th Congress, some Members have introduced legislation that spans the plastic lifecycle and encompasses various ways to respond to the impacts of plastics. **Table 5** includes bills where the primary focus of the bill is plastics, including appropriations bills and other omnibus legislation that include provisions addressing plastics.[179] Appropriations bills and other omnibus legislation that include provisions addressing plastics are included in **Table 5**, with the sections that pertain to plastics identified in the table notes.

[176] NOAA, Marine Debris Program, "Determining the Social Costs of Plastic Pollution," https://marinedebris.noaa.gov/research/determining-social-costs-plastic-pollution.

[177] NOAA, Marine Debris Program, "Determining the Social Costs of Plastic Pollution," https://marinedebris.noaa.gov/research/determining-social-costs-plastic-pollution.

[178] Claire M. Jordan, Senior Research Librarian, authored this section.

[179] To ascertain if a bill's primary focus is plastics, CRS searched Congress.gov using terms and phrases from the policy areas list and legislative subject term list. Congress.gov, "Policy Areas—Field Values," https://www.congress.gov/help/field-values/policy-area; Congress.gov, "Legislative Subject Terms—Field Values," https://www.congress.gov/help/field-values/legislative-subject-terms.

Table 5. Selected Plastics Legislation Introduced in the 118th Congress as of December 5, 2024

By date of introduction (most recent first)

Bill Number	Title	Description	Introduction Date	Most Recent Status	Identical Bill (Introduction Date)[a]
S.Res. 893	A resolution expressing the sense of the Senate regarding the Intergovernmental Negotiating Committee on Plastic Pollution's development of an international binding agreement, which is expected to be completed at its Fifth Session in Busan, Republic of Korea in December 2024	Expressing the sense of the Senate regarding the Intergovernmental Negotiating Committee on Plastic Pollution's development of an international binding agreement, which is expected to be completed at its Fifth Session in Busan, Republic of Korea in December 2024.	November 13, 2024	Referred to the Senate Committee on Foreign Relations on November 13, 2024.	
H.R. 9676	Accelerating a Circular Economy for Plastics and Recycling Innovation Act of 2024	To direct the Administrator of the Environmental Protection Agency (EPA) to establish National Plastics Recycling Standards, and for other purposes.	September 19, 2024	Referred to the House Committee on Energy and Commerce on September 19, 2024.	
S.Res. 763	A resolution designating July 2024 as "Plastic Pollution Action Month"	Designating July 2024 as "Plastic Pollution Action Month."	July 11, 2024	Referred to the Senate Committee on the Judiciary on July 11, 2024.	
H.Res. 1352	Expressing support for the designation of July 2024 as "Plastic Pollution Action Month"	Expressing support for the designation of July 2024 as "Plastic Pollution Action Month."	July 10, 2024	Referred to the House Committee on Energy and Commerce on July 10, 2024.	
H.R. 8812	Water Resources Development Act of 2024	To provide for improvements to the rivers and harbors of the United States, to provide for the conservation and development of water and related resources, and for other purposes.[b]	June 25, 2024	Passed the House and received in the Senate on July 23, 2024.	

Bill Number	Title	Description	Introduction Date	Most Recent Status	Identical Bill (Introduction Date)[a]
H.R. 8092	Protecting Communities from Plastics Act of 2024	To require the Administrator of the EPA to carry out certain activities to protect communities from the harmful effects of plastics, and for other purposes.	April 19, 2024	Referred to the Subcommittee on Conservation, Research, and Biotechnology by the House Committee on Agriculture on September 3, 2024.	S. 4194 (April 18, 2024)
S. 4186	Banning Toxics from Plastic Bottles Act of 2024	To eliminate toxic substances in beverage containers, and for other purposes.	April 18, 2024	Read twice and referred to the Senate Committee on Commerce, Science, and Transportation on April 18, 2024.	
H.Res. 1102	Further Consolidated Appropriations Act, 2024	See Division E, Title II, Section 210, plastic waste reduction.	March 22, 2024	Agreed to in the House and motion to reconsider laid on the table. Agreed to without objection on March 22, 2024.	
H.R. 7634	Plastic Pellet Free Waters Act	To require the Administrator of the EPA to promulgate certain limitations with respect to pre-production plastic pellet pollution, and for other purposes.	March 12, 2024	Referred to the Subcommittee on Water Resources and Environment by the House Committee on Transportation and Infrastructure on March 13, 2024.	S. 2337 (July 18, 2023)
S. 3623	Research for Healthy Soils Act	To amend the Food, Agriculture, Conservation, and Trade Act of 1990 to include as a high-priority research and extension area research on microplastics in land-applied biosolids on farmland, and for other purposes.	January 18, 2024	Read twice and referred to the Senate Committee on Agriculture, Nutrition, and Forestry on January 18, 2024.	
H.R. 6053	Break Free From Plastic Pollution Act of 2023	To amend the Solid Waste Disposal Act to reduce the production and use of certain single-use plastic products and packaging, to improve the responsibility of producers in the design, collection, reuse, recycling, and disposal of consumer products and packaging, to prevent pollution from consumer products and packaging from entering into animal and human food chains and waterways, and for other purposes.	October 25, 2023	Referred to the Subcommittee on Conservation, Research, and Biotechnology by the House Committee on Agriculture on January 18, 2024.	S. 3127 (October 25, 2023)

Bill Number	Title	Description	Introduction Date	Most Recent Status	Identical Bill (Introduction Date)[a]
H.R. 5564	REDUCE Act of 2023	To amend the Internal Revenue Code of 1986 to establish an excise tax on plastics.	September 19, 2023	Referred to the Subcommittee on Environment, Manufacturing, and Critical Materials by the House Committee on Energy and Commerce on September 22, 2023.	S. 2844 (September 19, 2023)
S. 2728	Reducing Waste in National Parks Act	To encourage reduction of disposable plastic products in units of the National Park System, and for other purposes.	September 6, 2023	Read twice and referred to the Senate Committee on Energy and Natural Resources on September 6, 2023.	H.R. 4561 (July 11, 2023)
H.R. 4821	Department of the Interior, Environment, and Related Agencies Appropriations Act, 2024	Making appropriations for the Department of the Interior, environment, and related agencies for the fiscal year ending September 30, 2024, and for other purposes.[c]	July 24, 2023	Passed the House on November 3, 2023. Received in the Senate, read twice, and placed on the Senate Legislative Calendar under General Orders on November 7, 2023.	
H.Res. 584	Expressing support for the designation of July as "Plastic Pollution Action Month."	Expressing support for the designation of July as "Plastic Pollution Action Month."	July 13, 2023	Referred to the Subcommittee on Environment, Manufacturing, and Critical Materials by the House Committee on Energy and Commerce on July 14, 2023.	S.Res. 296 (July 13, 2023)
H.R. 4040	Recycling and Composting Accountability Act	To require the Administrator of the EPA to carry out certain activities to improve recycling and composting programs in the United States, and for other purposes.	June 12, 2023	Referred to the Subcommittee on Environment, Manufacturing, and Critical Materials by the House Committee on Energy and Commerce on June 16, 2023.	
H.R. 3871	Research for Healthy Soils Act	To amend the Food, Agriculture, Conservation, and Trade Act of 1990 to include as a high-priority research and extension area research on microplastics in land-applied biosolids on farmland.	June 6, 2023	Referred to the Subcommittee on Conservation, Research, and Biotechnology by the House Committee on Agriculture on July 28, 2023.	
S. 1194	Recycling and Composting Accountability Act	To require the Administrator of the EPA to carry out certain activities to improve recycling and composting programs in the United States, and for other purposes.	April 19. 2023	Passed the Senate on March 12, 2024, and held at the House desk on March 15, 2024.	

Bill Number	Title	Description	Introduction Date	Most Recent Status	Identical Bill (Introduction Date)[a]
H.R. 873	Water Quality and Environmental Innovation Act	To authorize the Administrator of the EPA to award grants and contracts for projects that use emerging technologies to address threats to water quality [including the accumulation of plastics, trash, and microplastics], and for other purposes.	February 8, 2023	Referred to the Subcommittee on Environment, Manufacturing, and Critical Materials by the House Committee on Energy and Commerce on February 17, 2023.	

Source: Compiled by the Congressional Research Service (CRS) from Congress.gov; Congress.gov, "Policy Areas—Field Values," https://www.congress.gov/help/field-values/policy-area; and Congress.gov, "Legislative Subject Terms—Field Values," https://www.congress.gov/help/field-values/legislative-subject-terms.

Notes: This table includes legislation where the primary focus of the bill is addressing plastics somewhere along the lifecycle (e.g., manufacturing, production, and waste). Bill descriptions are pulled directly from bill text. Text in brackets is written by CRS and included for clarity.

a. Bills listed in this column are included based on criteria established by Congress.gov. In instances where Congress.gov labels a bill as "related" instead of "identical," CRS included those related bills as separate entries in this table. "About Related Bills," Congress.gov, https://www.congress.gov/help/related-bills.

b. See Section 207, "Examination of reduction of microplastics."

c. See Section 539 ("None of the funds made available by this Act may be used to implement, administer, apply, enforce, or carry out any plastic straw prohibitions.").

U.S. Engagement in Plastic-Pollution-Related International Agreements FAQs

How Does the United States Engage in International Agreements Related to Plastic Pollution?[180]

The United States has engaged in a number of international environmental agreements that pertain to solid and hazardous waste and marine pollution, including plastics, that may have implications with respect to plastic pollution. This response discusses three selected international agreements as examples of U.S. engagement on international efforts related to plastic pollution and is not comprehensive. The three selected agreements include the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention); the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972 (London Convention) and the 1996 London Protocol; and International Convention for the Prevention of Pollution from Ships (MARPOL Convention). Other international agreements, such as the Environmental Protocol to the Antarctic Treaty, or various bilateral or regional agreements, such as the United States-Mexico-Canada Agreement, may also have implications for plastic pollution.[181] In addition, the SOS 2.0 Act, which Congress enacted in 2020, directs the President to take certain actions with regard to engagement in international agreements pertaining to plastic pollution.[182]

The manner in which the United States accepts international agreements as binding and incorporates their provisions into domestic law can vary depending on the specific content of the obligations, such as the extent of domestic implementing authority, and the status of ratification.[183] For example, the United States is a signatory to all of the agreements discussed below, and as such is obligated to not undermine their object and purpose, even if (such as in the case of the Basel Convention, as discussed below) it has not ratified the treaty and thus is not bound by the articles therein.[184] Should the President decide to communicate that the United

[180] Kristen Hite, Legislative Attorney, authored this section.

[181] For example, Article 5 of Annex IV to the Environmental Protocol to the Antarctic Treaty prohibits the disposal into the sea of all plastics. See 1991 Protocol on Environmental Protection to the Antarctic Treaty and its Annexes (Madrid Protocol), October 4, 1991, 30 I.L.M. 1455, entered into force January 14, 1998. The United States-Mexico-Canada Agreement includes an article on marine litter, recognizing "the importance of taking action to prevent and reduce marine litter, including plastic litter and microplastics." See Agreement on Environmental Cooperation Among the Governments of the United States of America, the United Mexican States and Canada, art. 24.12, July 1, 2020, T.I.A.S. 20-701.

[182] For further information on these actions, see CRS In Focus IF12690, *International Agreement on Plastic Pollution: Negotiations*, by Jonathan D. Haskett and Kristen Hite.

[183] In the United States, the State Department generally considers whether the agreement would require seeking the advice and consent of the Senate in deciding whether to consent to become bound, or whether it could consent to be bound based on authorities in existing statutes or granted to the President in Article II of the Constitution. See Department of State, Exercise of the International Agreement Power, Foreign Affairs Manual, 11 FAM 723, https://fam.state.gov/fam/11fam/11fam0720.html. If the President transmits the text of a treaty to the Senate for advice and consent, the executive branch typically awaits a Senate resolution of ratification before deciding whether to ratify. See ibid.; see also CRS Legal Sidebar LSB11048, *International Agreements (Part I): Overview and Agreement-Making Process*, by Steve P. Mulligan.

[184] See Vienna Convention on the Law of Treaties art. 18(a), May 23, 1969, 1155 U.N.T.S. 331, which the United States has signed but not ratified (the Senate has not provided its advice and consent); however, the United States does (continued...)

States has agreed to ratify or otherwise become bound by the terms of an international agreement, the obligations in the agreement would become binding on the United States once the treaty enters into force (such as in the case of the London Convention but not the London Protocol, both of which are discussed below).[185] In some cases, implementing legislation may be necessary in order for treaty provisions to be enforceable in U.S. courts (such as is the case for the Act to Prevent Pollution from Ships, discussed below as implementing legislation to the MARPOL Convention).[186]

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal[187]

The goals of the Basel Convention, which entered into force in May 1992, are to encourage the environmentally sound management of hazardous wastes and to protect developing countries from receiving hazardous wastes without prior informed consent.[188] The United States is a signatory to the Basel Convention, but has not ratified it and is not a party to the Convention; however, the United States may trade hazardous wastes with other parties to the Basel Convention if it has agreements substantially similar to those contained in the Basel Convention.[189] The Basel Convention was crafted to permit the safe transboundary movements of waste among nations with environmental protection programs and to prevent the shipment of waste to inappropriate facilities in countries lacking the means to control waste management and disposal activities. The treaty addresses waste imports and exports and covers all wastes defined as hazardous by the originating, receiving, and transit countries. To date, the Basel Convention has been ratified, accepted, approved, or acceded to by 191 countries.[190]

In May 2019, specifically intending to control transboundary plastic wastes, the Conference of the Parties to the Basel Convention amended the Convention with the Plastic Waste Amendments.[191] The amendments, which entered into force in 2021, specified which wastes are

recognize much of its content as customary international law. See, for example, Restatement (Fourth) of Foreign Relations Law: Jurisdiction Treaties §106 TD No 2 (2017).

[185] Entry into force is the point at which the obligations contained in a final treaty text become binding on the countries that have consented to be bound, whether by ratification, agreement, or another agreed process. It is common for countries to set the date of entry into force at a certain number of days after an agreed number of countries have ratified or otherwise consented to be bound. For general information on treaties, see United Nations Office of Treaty Affairs, *Treaty Handbook* (rev. ed. 2013).

[186] See Medellín v. Texas, 552 U.S. 491, 525–26 (2008). Whether or not courts enforce an international agreement domestically has no bearing on whether an agreement is binding on the United States as a matter of international law For more information on the intersection of international obligations and domestic law, see CRS Report RL32528, *International Law and Agreements: Their Effect upon U.S. Law*, by Steve P. Mulligan.

[187] Angela C. Jones, Analyst in Environmental Policy, authored this section.

[188] Secretariat of the Basel Convention, "Text of the Convention," https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx. *Entry into force* means that the agreement has become binding on all parties that have expressed their consent to be bound.

[189] See Basel Convention Article 11. Since 1992, the United States also has participated in a regional agreement with all other members of the OECD, governing movements of waste destined for recycling or other recovery (*Decision of the Council Concerning the Control of Transfrontier Movements of Wastes Destined for Recovery Operations*, OECD/LEGAL/0266, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0266.)

[190] Secretariat of the Basel Convention, "Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal," https://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx.

[191] Secretariat of the Basel Convention, "Basel Convention Plastic Waste Amendments," https://www.basel.int/Implementation/Plasticwaste/Amendments/Overview/tabid/8426/Default.aspx (hereinafter Secretariat of the Basel Convention, "Basel Convention Plastic Waste Amendments").

subject to prior informed consent (PIC) procedures among Basel parties exporting and importing plastic waste and scrap.[192] The amendments amended several annexes to the convention that list the plastic wastes that are considered hazardous and subject to Basel PIC requirements, plastic wastes that require "special consideration" (also subject to PIC requirements), and plastic wastes that are presumed not to be hazardous whose disposal could be managed in an environmentally sound manner (exempt from the PIC requirements).[193]

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972 (London Convention) and the 1996 London Protocol[194]

The London Convention of 1972 was one of the first global treaties aimed at protecting the marine environment from human activities. It applies to the deliberate disposal, or "dumping," of wastes or other matter from vessels, aircraft, platforms, and other man-made structures at sea.[195] "Wastes or other matter" is defined broadly to mean "material and substance of any kind, form or description," and thereby includes plastic waste.[196] The London Convention requires that contracting parties issue a permit for the dumping of wastes and other matter at sea and generally prohibits the dumping of certain hazardous materials.[197] The United States ratified the convention in 1974, and the convention entered into force in 1975. To date, there are 87 parties to the convention.[198]

Congress enacted the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA; P.L. 92-532) and its amendments to implement the requirements of the London Convention.[199] Under MPRSA, often referred to as the Ocean Dumping Act, certain materials (e.g., radiological, chemical, and biological warfare agents; industrial wastes; medical wastes) may not be dumped, and others may not be dumped without a permit from EPA or the U.S. Army Corps of Engineers. Title I of MPRSA authorizes federal permitting and enforcement actions to regulate the disposal of wastes in ocean waters.[200]

[192] Secretariat of the Basel Convention, "Basel Convention Plastic Waste Amendments."

[193] Secretariat of the Basel Convention, "Basel Convention Plastic Waste Amendments."

[194] Laura Gatz, Specialist in Environmental Policy, authored this section.

[195] For more about the London Convention, see EPA, "Ocean Dumping: London Convention and London Protocol: International Treaties to Prevent Marine Pollution," https://www.epa.gov/ocean-dumping/london-convention-and-london-protocol-international-treaties-prevent-marine-pollution; International Maritime Organization (IMO), "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," https://www.imo.org/en/OurWork/Environment/Pages/London-Convention-Protocol.aspx; "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," p. 2, https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/LC1972.pdf.

[196] "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," p. 3, https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/LC1972.pdf.

[197] "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," p. 3, https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/LC1972.pdf. See also IMO, "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," https://www.imo.org/en/OurWork/Environment/Pages/London-Convention-Protocol.aspx.

[198] IMO, "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," https://www.imo.org/en/OurWork/Environment/Pages/London-Convention-Protocol.aspx.

[199] 33 U.S.C. §§1401 et seq.

[200] 33 U.S.C. §§1411-1420.

In 1996, the parties negotiated a new treaty, the London Protocol, to modernize the London Convention.[201] The purpose of the London Protocol is similar to, but more restrictive than, the London Convention.[202] Under the London Protocol, dumping of all wastes and other matter at sea is prohibited except for certain potentially acceptable wastes listed under Annex 1 (e.g., dredged material, fish waste, natural organic material).[203] The London Protocol entered into force in 2006; there are 53 parties.[204] The United States participated in the London Protocol's development and signed it in 1998. To date, the Senate has not given its advice and consent to ratification of the London Protocol.[205]

International Convention for the Prevention of Pollution from Ships, 1973, as Modified by the Protocol of 1978 (MARPOL 73/78)[206]

The MARPOL Convention is the primary international agreement for preventing marine pollution by ships from operational or accidental causes.[207] The convention includes requirements to address garbage, including plastics (Annex V), as well as oil (Annex I); noxious liquid substances carried in bulk (Annex II); harmful packaged substances (Annex III); sewage (Annex IV); and air pollution (Annex VI).[208] According to the International Maritime Organization (IMO), "the most important feature of the Annex [Annex V, which addresses garbage and plastics] is the complete ban imposed on the disposal into the sea of all forms of plastics."[209] In 1973, the IMO adopted the 1973 MARPOL Convention.[210] Five years later, in response to a number of tanker accidents, the IMO adopted the Protocol of 1978. At that time, the 1973 convention that the Protocol of 1978 modified had not yet entered into force, so the protocol absorbed the parent convention.[211] The combined instrument (MARPOL 73/78) provided that countries may become parties to MARPOL

[201] EPA, "Ocean Dumping: London Convention and London Protocol: International Treaties to Prevent Marine Pollution," https://www.epa.gov/ocean-dumping/london-convention-and-london-protocol-international-treaties-prevent-marine-pollution.

[202] IMO, "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," https://www.imo.org/en/OurWork/Environment/Pages/London-Convention-Protocol.aspx.

[203] "1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (as amended in 2006)," pp. 4, 17, https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/PROTOCOLAmended2006.pdf.

[204] "1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (as amended in 2006)," pp. 4, 17, https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/PROTOCOLAmended2006.pdf.

[205] The London Protocol was submitted to the Senate for its advice and consent to ratification in 2007. The Senate Foreign Relations Committee favorably reported the protocol with one understanding and two declarations, and as set forth in a report dated September 11, 2008, recommended the full Senate give its consent to ratification. The George W. Bush Administration submitted proposed implementing legislation along with a section-by-section analysis in 2007. No action was taken on the proposed legislation. See links to these documents at NOAA, "Marine Pollution: Ocean Dumping," https://www.noaa.gov/gc-international-section/marine-pollution-ocean-dumping.

[206] Laura Gatz, Specialist in Environmental Policy, authored this section.

[207] IMO, "International Convention for the Prevention of Pollution from Ships," https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx (hereinafter, IMO, International Convention for the Prevention of Pollution from Ships).

[208] These requirements vary by Annex, but include requirements for ships to have certain equipment onboard that allows for removal of certain pollutants, required handling procedures for certain substances, and regulations for the management and disposal of certain materials (such as ship-generated garbage).

[209] IMO, International Convention for the Prevention of Pollution from Ships. The IMO is a specialized agency of the United Nations responsible for regulating maritime transport.

[210] IMO, International Convention for the Prevention of Pollution from Ships.

[211] IMO, International Convention for the Prevention of Pollution from Ships.

73/78 by only ratifying Annexes I and II.[212] Annexes III, IV, and V are optional.[213] MARPOL 73/78 entered into force in 1983 (for Annexes I and II).[214] Optional Annexes V, III, and IV entered into force in 1988, 1992, and 2003, respectively.[215] The 1997 Protocol, which entered into force in 2005, amended MARPOL 73/78 to add Annex VI.[216]

The United States is a party to Annexes I, II, III, V and VI.[217] Congress incorporated Annexes I, II, V, and VI into U.S. law through the Act to Prevent Pollution from Ships (APPS; P.L. 96-478).[218] Specific to plastics, under Annex V, APPS prohibits the discharge of synthetic ropes and fishing nets, plastic garbage bags, and certain incinerator ashes from plastic products.[219]

What Is the International Agreement on Plastic Pollution?[220]

In 2022 the United Nations Environment Assembly (UNEA) passed a resolution that created an International Negotiating Committee (INC) to develop a legally binding international agreement on plastic pollution, including in the marine environment.[221] The international agreement would address the full lifecycle of plastic, including its production, design, and disposal.[222] It would also require party countries to prepare national action plans with "country-driven approaches" to help prevent, reduce, and eliminate plastic pollution, while recognizing that full implementation for less wealthy countries would depend on the provision of financing, capacity building, and technical support.[223] The UNEA resolution sets a goal of completing negotiations by the end of 2024 and contemplates that a final agreement could include both binding and voluntary approaches.[224]

Countries convened five INC meetings between 2022 and 2024 to create and edit draft text of the agreement as well as rules of procedure.[225] At the conclusion of the fifth meeting, much of the

[212] IMO, *Focus on IMO: MARPOL—25 Years*, October 1998, https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/ConferencesMeetings/FocusOnIMOArchives/Focus%20on%20IMO%20-%20MARPOL%20-%2025%20years%20 (October%201998).pdf (hereinafter IMO, *Focus on IMO: MARPOL—25 Years*).

[213] IMO, *Focus on IMO: MARPOL—25 Years*.

[214] IMO, *Focus on IMO: MARPOL—25 Years*.

[215] IMO, *Focus on IMO: MARPOL—25 Years*; IMO, International Convention for the Prevention of Pollution from Ships.

[216] IMO, International Convention for the Prevention of Pollution from Ships.

[217] The U.S. ratified MARPOL 73/78 along with Annexes II and IV in 1980. The United States ratified optional Annexes V, III, and VI in 1987, 1991, and 2008, respectively.

[218] 33 U.S.C. §§1901 et seq. The Marine Protection, Research and Sanctuaries Act and the Marine Pollution Prevention Act included amendments to the Act to Prevent Pollution from Ships. With regards to remaining annexes (Annexes III and IV), the United States implements Annex III through the Hazardous Materials Transportation Act (P.L. 93-633; 49 U.S.C. §§5101 et seq.). The United States has not signed or ratified Annex IV, but it regulates sewage from vessels under the Clean Water Act (33 U.S.C. §1322).

[219] 33 U.S.C. §1902(b)(3).

[220] Jonathan D. Haskett, Analyst in Environmental Policy, and Kristen Hite, Legislative Attorney, coauthored this section.

[221] United Nations Environment Program (UNEP), "UNEA Resolution 5/14 Entitled 'End Plastic Pollution: Towards an International Legally Binding Instrument,'" UNEP/PP/OEWG/1/INF/1, 2022 (hereinafter UNEA Resolution 5/14). See also CRS In Focus IF12690, *International Agreement on Plastic Pollution: Negotiations*, by Jonathan D. Haskett and Kristen Hite.

[222] UNEA Resolution 5/14.

[223] UNEA Resolution 5/14, paras 2, 3(d), 3(e).

[224] UNEA Resolution 5/14, para 1.

[225] UNEP, "Intergovernmental Negotiating Committee on Plastic Pollution," https://www.unep.org/inc-plastic-
(continued...)

text remained under active negotiation, including on matters such as finance as well as approaches for addressing plastic products and chemicals of concern.[226] Countries held the first part of their fifth negotiating meeting (INC-5) in the Republic of Korea from November 25 to December 1, 2024, with hopes that the fifth meeting could make sufficient progress to then convene a summit for countries to adopt a final version of the agreement.[227]

Countries agreed during the Korea meeting that a draft prepared by the chair of INC-5 would serve as the basis of negotiations, including the following components:[228]

- Objective: to protect human health and the environment from plastic pollution, including in the marine environment.
- Obligations, such as those related to plastic products, product designs and production, plastic releases and leakages, waste management, existing pollution (including marine pollution), just transition, and transparency. Negotiations are still clarifying to what extent countries would be allowed to exempt specific listed products, such as certain single-use plastics or other chemicals of concern from phase-out.
- Means of implementation, including finance, capacity building, technical assistance, and technology transfer.
- Procedural obligations pertaining to national plans, reporting and assessment, and provisions for international cooperation.
- Governance, including a global plenary body, a secretariat, scientific or other subsidiary bodies, and dispute settlement procedures.

Though they agreed to certain elements, countries were unable to finalize other portions of the treaty text before the meeting ended and agreed to continue the meeting at an unspecified future

pollution; see also International Institute for Sustainable Development (IISD), "Summary Report, 26 November–2 December 2022 1st Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (INC-1)," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc1-summary; IISD "Summary Report, 29 May-2 June 2023 2nd Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (INC-2)," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc2-summary; IISD, "Summary Report, 11-19 November 2023 3rd Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (INC-3)," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc3-summary; IISD, "Summary Report, 23-29 April 2024 4th Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (INC-4)," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc4-summary; "Summary Report, 25 November-1 December 2024, 5th Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (INC-5)," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc5-summary.

[226] IISD, "Summary Report, 25 November-1 December 2024," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc5-summary.

[227] UNEP, "Fifth Session (INC-5)," https://www.unep.org/inc-plastic-pollution/session-5; UNEA Resolution 5/14, UNEP/PP/OEWG/1/INF/1, 2022.

[228] UNEP, *Compilation of Draft Text of the International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (Advance Copy), Fifth Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment (Provisional Agenda Meeting Item 4, Busan, 25 November-1 December 2024*, UNEP Doc. No. UNEP/PP/INC.5/4, July 9, 2024, https://wedocs.unep.org/bitstream/handle/20.500.11822/45858/Compilation_Text.pdf. See also Ambassador Luis Vayas Valdivieso, *Non-Paper 3 of the Chair of the International Negotiating Committee*, October 29, 2024, https://wedocs.unep.org/bitstream/handle/20.500.11822/46483/Non_Paper_3_E.pdf.

date.[229] By the end of the meeting in Busan, news reports indicated that roughly 100 countries had agreed on many provisions.[230]

What Policy Options Are Available to Congress to Address Plastic Pollution?[231]

Many recognize the utility of plastics and their integral benefits to society. Plastics have a prominent role in many aspects of daily life, including food supply systems, health care, energy and water infrastructure systems, transportation systems, and construction. At the same time, nationally and globally, there is increasing recognition of the growing concerns of plastic pollution and related environmental impacts that occur across the plastic lifecycle. Some stakeholders assert that the status quo, or "business as usual" approach to the production and use of plastics and the management of plastic waste, is not sustainable, meaning that linear approaches are generating increasingly greater amounts of plastic waste, plastic pollution, and related environmental impacts.[232] A wide variety of stakeholders, including federal entities, international bodies, and industry groups, support improvements to the circularity of plastics, including keeping materials and products in circulation for as long as possible, redesigning materials and products to be less resource intensive, and recapturing plastic waste as a resource to manufacture new materials and products.[233]

Some federal entities and international bodies argue that a globally coordinated effort adopting policy tools across the plastic lifecycle is needed to reduce plastic pollution.[234] To this end, the Interagency Policy Committee on Plastic Pollution and a Circular Economy, established under the Biden Administration, published a report in July 2024. In the report, the Administration stated that "the Federal government is—for the first time—formally acknowledging the severity of the plastic pollution crisis and the scale of the response that will be required to effectively confront it." The report further states that (1) "successfully combatting plastic pollution requires the United States to take a comprehensive approach that addresses the impacts of plastic throughout the entire lifecycle," and (2) "the scope, scale, and complexity of plastic pollution require coordinated action from all levels of government."[235]

OECD's *Policy Scenarios for Eliminating Plastic Pollution by 2040*, which the organization published in October 2024, emphasizes that "business as usual" practices are unsustainable given

[229] See analysis section in IISD, "Summary Report, 25 November-1 December 2024," https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc5-summary#brief-analysis-inc-5.

[230] Ellie Borst, "UN Plastics Treaty Talks End with No Deal. What Now?" *E&E News: Greenwire*, December 2, 2024.

[231] Laura Gatz, Specialist in Environmental Policy, authored this section.

[232] OECD, *Global Plastics Outlook: Policy Scenarios to 2060*, p. 17; IPC, *Mobilizing Federal Action on Plastic Pollution*, pp. 2-3; EPA, "Plastics: Regulation and Policy," https://www.epa.gov/plastics/regulation-and-policy; U.S. Department of State, "Plastic Pollution," https://www.state.gov/key-topics-office-of-environmental-quality-and-transboundary-issues/plastic-pollution/; and UNEP, *Turning Off the Tap*.

[233] OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*; EPA, *National Strategy to Prevent Plastic Pollution*; America's Plastic Makers and ACC, *5 Actions for Sustainable Change*; and UNEP, *Turning off the Tap*.

[234] OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*; IPC, *Mobilizing Federal Action on Plastic Pollution*; EPA, *National Strategy to Prevent Plastic Pollution*; and UNEP, *Turning off the Tap*.

[235] IPC, *Mobilizing Federal Action on Plastic Pollution*, pp. 2-3.

the rapid increase in plastic flows and their environmental impacts.[236] They similarly conclude that reducing plastic pollution will require ambitious action by all countries, with policy measures implemented across all stages of the plastic lifecycle.

The United Nations Environment Programme (UNEP), which is a host of the INC, also stresses the importance of shifting from a "business as usual" plastics economy, which it describes as linear, to a circular plastics economy through its proposed systems change scenario.[237] This systems-change scenario proposes three market shifts to move toward circularity: reuse, recycling, and reorienting and diversifying (i.e., shaping the market for alternatives to virgin fossil-fuel-based plastics).

Some stakeholders, such as the plastics and petrochemical industries, support the goal of eliminating plastic pollution while retaining the societal benefits of plastic.[238] These industry stakeholders support focusing on policy tools that address certain aspects of the lifecycle, such as modernizing recycling infrastructure and developing end markets for recycled material, and oppose tools that aim to limit aspects of plastic production.[239] These groups emphasize the importance of plastics to the U.S. economy and argue that plastics are more affordable, more versatile, have lower GHG emission profiles, and require less water and raw materials to produce compared to alternatives (e.g., paper, glass, metal).[240] Rather than employing tools that might cap production or ban or restrict certain types of polymers or plastics, industry stakeholders advocate for rapidly scaling chemical recycling while continuing to grow mechanical recycling.[241] In addition, they advocate for other policy tools to help increase recycling rates and enable growth of the circular economy.[242]

Federal agencies in the United States, international organizations, industry groups, nongovernmental organizations, and others have published various reports, policy statements, and other outreach materials that identify, assess, and/or advocate for various policy options and tools

[236] OECD, *Policy Scenarios for Eliminating Plastic Pollution by 2040*, October 2, 2024, https://www.oecd.org/en/publications/policy-scenarios-for-eliminating-plastic-pollution-by-2040_76400890-en/full-report.html.

[237] UNEP, *Turning off the Tap*, pp. xiii-xvi.

[238] America's Plastic Makers, "Global Agreement on Plastic Pollution: How Should It Work?" https://plasticmakers.org/plastic-makers-support-a-global-agreement-to-eliminate-plastic-waste/; American Fuel and Petrochemical Manufacturers, "Plastic Waste Can Be Eliminated Without Banning Plastic Production," press release, November 14, 2023, https://www.afpm.org/newsroom/news/plastic-waste-can-be-eliminated-without-banning-plastic-production.

[239] PLASTICS Industry Association, "PLASTICS Applauds Introduction of Bipartisan Legislation to Modernize Recycling Infrastructure," press release, September 20, 2024, https://www.plasticsindustry.org/newsroom/plastics-applauds-introduction-of-bipartisan-legislation-to-modernize-recycling-infrastructure/; PLASTICS Industry Association, "PLASTICS Strongly Opposes White House Position Change on Plastic Production Caps," press release, August 15, 2024, https://www.plasticsindustry.org/newsroom/plastics-strongly-opposes-white-house-position-change-on-plastic-production-caps/; American Fuel and Petrochemical Manufacturers, "Plastic Waste Can Be Eliminated Without Banning Plastic Production," press release, November 14, 2023, https://www.afpm.org/newsroom/news/plastic-waste-can-be-eliminated-without-banning-plastic-production; and America's Plastic Makers and ACC, *5 Actions for Sustainable Change*.

[240] American Fuel and Petrochemical Manufacturers, "Plastic Waste Can Be Eliminated Without Banning Plastic Production," press release, November 14, 2023, https://www.afpm.org/newsroom/news/plastic-waste-can-be-eliminated-without-banning-plastic-production; America's Plastic Makers and ACC, *5 Actions for Sustainable Change*.

[241] American Fuel and Petrochemical Manufacturers, "Plastic Waste Can Be Eliminated Without Banning Plastic Production," press release, November 14, 2023, https://www.afpm.org/newsroom/news/plastic-waste-can-be-eliminated-without-banning-plastic-production; America's Plastic Makers and ACC, *5 Actions for Sustainable Change*.

[242] America's Plastic Makers and ACC, *5 Actions for Sustainable Change*. PLASTICS Industry Association, "PLASTICS Applauds Introduction of Bipartisan Legislation to Modernize Recycling Infrastructure," press release, September 20, 2024, https://www.plasticsindustry.org/newsroom/plastics-applauds-introduction-of-bipartisan-legislation-to-modernize-recycling-infrastructure/.

to address plastic pollution across the plastic lifecycle. **Table 6** summarizes a range of selected policy options and tools by lifecycle stage and policy objective, as identified by selected entities and publications. CRS selected these publications, which each examine policy options to address plastic pollution across the plastic lifecycle, to represent a variety of stakeholder views (e.g., U.S. federal government, international, and industry). Table notes identify the sources (e.g., reports and respective entities) that identify, assess, and/or advocate for each of these options. CRS listed sources for policy options mentioned in the selected reports. A source not being included for a particular policy option does not necessarily mean the entity does not support it.

Policy options or tools to reduce plastic pollution and improve circularity generally fall under one or more of the following broader policy objectives: reducing production or demand for certain plastics or plastic products; designing plastic products for circularity; improving post-use disposal, including enhancing recycling; and minimizing pollution and closing leakage pathways into the environment. In **Table 6**, some of these policy options and tools are listed under more than one objective. This analysis should not be considered comprehensive; rather it outlines a wide range of policy options and tools available to address plastic pollution. Some of these options may require further congressional authorization in order to be implemented at the federal level.

Table 6. Selected Policy Options to Address Plastic Pollution

Lifecycle Stage	Policy Objective	Policy Options and Tools
Plastic Production and Product Manufacturing	Reduce production and demand of certain plastics (such as single-use, unrecyclable, or frequently littered plastic products)[abcd]	Identify single-use, unrecyclable, or frequently littered plastic products and identify alternative materials, products, or systems with fewer environmental impacts, including through lifecycle analysis[abcd]
		Establish an innovation challenge program to develop alternative materials, products, or systems with fewer environmental impacts[a]
		Promote industry-wide innovation in design and materials management, such as through economic incentives to maximize the value of and trade in recycled and recyclable materials[ce]
	Increase the demand for recycled plastic[e]	Develop fiscal policy incentives for companies shifting operations to circular plastics[de]
		Reduce single-use plastic products across the federal government (e.g., through the acquisition process)[ac]
		Review and potentially revise government purchasing criteria to ensure the government is purchasing sustainable products (e.g., products that have recycled content or can be reused)[abcd]
		Tax virgin plastic feedstock[d]
		Tax certain plastic products (e.g., single-use products, frequently littered items, plastics under a certain recycled content, primary or virgin plastics)[b]
		Ban certain plastic products (e.g., single-use products, frequently littered items)[bd]
		Ban specific chemicals in plastics (e.g., additives and polymers that are particularly hazardous to human health and the environment)[d]
		Impose restrictions, caps, or targets on primary polymer production[b]
		Reform fossil fuel subsidies that keep the prices of feedstock low[bd]
		Establish recycled content standards (e.g., requiring plastic packaging or products to include a certain percentage of recycled plastic)[bcde]
		Establish extended producer responsibility[abcde]
	Design products for circularity (products that can be more easily or more efficiently reused or recycled, or that have higher recycled content)[abce]	Coordinate domestic and international interests to support the development of international standards, including product labeling, to increase the circularity of plastic products[ab]
		Establish a single, standardized, global plastics labeling scheme[d]
		Create labels to demonstrate compliance with recycled content requirements[e]
		Establish international standards and definitions for compostable and biodegradable materials[d]
		Establish recycled content standards (e.g., requiring plastic packaging or products to include a certain percentage of recycled plastic)[bcde]
		Establish design criteria and product standards for reuse and durability[bd]

Lifecycle Stage	Policy Objective	Policy Options and Tools
		Establish design criteria to improve recyclability (e.g., remove dyes, pigments, and additives that interfere with recycling economics)[d]
		Establish design criteria to address microplastic leakage during use (e.g., tires and textiles)[bd]
		Establish design criteria to substitute away from plastics where beneficial (e.g., paper plates or metal reusable water bottles)[bd]
		Phase out or ban certain plastics, applications, polymers, or chemicals of concern[bd]
Post-Use Disposal	Improve post-use materials management and enhance recycling and reuse[abcde]	Enhance the effectiveness of existing public policies and incentives for decreasing waste generation and increasing the reuse, collection, recycling, and conservation of plastic materials[a]
		Establish extended producer responsibility[abcde]
		Develop or expand capacity to maximize reuse (e.g., by providing funding to communities to create and implement reuse plans and by researching obstacles to reuse and proposing solutions)[ad]
		Enhance reuse schemes (e.g., bulk dispensers in store, deposits and packaging take-back, washing, and repair)[d]
		Develop fiscal policy incentives for companies that implement reuse models[d]
		Facilitate more effective composting of certified compostable products (e.g., through funding to improve community composting capacity and reviewing and if needed, updating compostable product standards)[ac]
		Establish recycled content standards (e.g., requiring plastic packaging or products to include a certain percentage of recycled plastic)[bcde]
		Adopt national recycling standards (e.g., minimum household access standards, minimum infrastructure capacity standards, metrics and reporting standards to assess progress toward recycling goals)[e]
		Support the development, deployment, and investment in technologies and infrastructure for solid waste collection, sorting, and recycling[abcde]
		Scale up mechanical recycling capacity[de]
		Support rapid scaling of chemical recycling, including by updating/clarifying regulatory requirements for these facilities to improve consistency and regulatory certainty[e]
		Support chemical recycling, if and when its sustainability is demonstrated through lifecycle analysis, for products that mechanical recycling cannot manage[d]
		Develop international standard and definitions for compostable and biodegradable materials[d]
		Improve labeling to improve consumer sorting of waste[d]
		Develop deposit-refund strategies[bd]
		Incentivize sorting/recycling in households by employing pay-as-you-throw regimes (i.e., consumers pay a variable cost per bag or weight of mixed waste)[b]
		Impose landfill fees or taxes[bd]

Lifecycle Stage	Policy Objective	Policy Options and Tools
		Impose incineration fees or taxes[bd]
		Support/explore possible ratification of the Basel Convention[acd]
Environmental Leakage/Pollution	Minimize pollution and environmental and health-related impacts across the plastic lifecycle[abc]	Perform lifecycle assessments of plastic products and potential alternatives to improve understanding of the health, environmental, social, and economic impacts of products across their lifespan[abcde]
		Develop methods to measure reductions in greenhouse gas (GHG) emissions from the lifecycle of plastic products and alternative materials as part of meeting global, national, and state GHG emissions goals[a]
		Prioritize and evaluate research on primary plastic polymers, precursors, and associated chemicals of concern to assist relevant agencies with mitigating risks to public health or the environment[c]
		Leverage federal research and funding to conduct or support studies on human health impacts of exposure across the plastic lifecycle, including microplastics and nanoplastics and associated additives[c]
		Review, develop, update, and use sustainability standards, ecolabels (i.e., labels that help consumers identify products that meet specific environmental performance), certifications, and design guidelines that decrease the environmental impacts of plastic products[a]
		Establish design criteria to address microplastic leakage during use (e.g., tires and textiles)[bd]
		Encourage industry-led, state-authorized, and voluntary actions to reduce harmful air, land, and water emissions from plastic production, including chemical additives[c]
		Explore updates, such as to rules, guidance, labeling, or other policies under existing statutes (including the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Safe Drinking Water Act, Toxic Substances Control Act, Consumer Product Safety Improvement Act, Federal Food, Drug, and Cosmetic Act) that may affect pollution related to the production or use of plastic, polymers, precursors, and related chemicals[c]
		Review and update, as appropriate, regulations relating to air emissions, water discharges of pollutants, waste disposal from plastic production and recycling facilities, and other health and safety measures, including regulation of the production and transport of plastic pellets and plastic additives[ac]
	Prevent trash and microplastics from entering waterways[abc]	Explore expanded use of Clean Water Act authorities to reduce trash loadings into waterways[ac]
		Provide federal technical assistance to communities to include new or improved trash reduction and removal actions in watershed, stormwater management, and related plans[a]
		Improve water management to increase trash and microplastic capture in waterways and stormwater/wastewater systems (e.g., fund research, development, deployment, and maintenance of technologies and processes that capture trash or microplastics in waterways, stormwater, and wastewater)[ab]
		Increase and improve measurement of trash and plastic pollution loadings into waterways (i.e., trash and plastic entering waterways) to inform the development of effective and targeted mitigation strategies[ac]
		Increase and coordinate research on microplastics and nanoplastics in waterways and oceans (e.g., research the sources, transport, fate, and concentrations, impacts, and mitigation of microplastic and nanoplastic pollution; support

Lifecycle Stage	Policy Objective	Policy Options and Tools
		development of technologies to prevent microplastics and nanoplastics from entering waterways; develop standardized methods for collection, extraction, quantification, and characterization of microplastics and nanoplastics)[ac]
		Explore options and support programs that address abandoned, lost, and discarded fishing gear and vessels (e.g., biodegradable designs, education, disposal and recycling options, clean-ups)[bcd]
		Improved municipal litter management[b]
		Evaluate and adopt interventions to mitigate plastic and pellet loss during manufacturing and transport[bcd]
		Increase public education and outreach about plastic pollution[ac]

Source: Congressional Research Service (CRS) analysis of policy options and tools, as identified by selected entities and publications assessing such options to address plastic pollution across the plastic lifecycle. CRS selected these entities and publications to represent a variety of stakeholder views (e.g., U.S. federal government, international, and industry).

Notes: Sources were listed for policy options mentioned in the reports. A source not being included for a particular policy option does not necessarily mean the entity does not support it. This analysis should not be considered comprehensive; rather, it outlines a wide range of policy options and tools available to address plastic pollution.

a. U.S. Environmental Protection Agency (EPA), *National Strategy to Prevent Plastic Pollution*, 2024, https://www.epa.gov/circulareconomy/national-strategy-prevent-plastic-pollution.

b. Organisation for Economic Cooperation and Development (OECD), *Policy Scenarios for Eliminating Plastic Pollution by 2040*, October 2, 2024, https://www.oecd.org/en/publications/policy-scenarios-for-eliminating-plastic-pollution-by-2040_76400890-en/full-report.html; and OECD, *Global Plastics Outlook: Economic Drivers, Environmental Impacts, and Policy Options*, February 2022, https://www.oecd-ilibrary.org/environment/global-plastics-outlook_de747aef-en.

c. Interagency Policy Committee on Plastic Pollution and a Circular Economy (IPC), *Mobilizing Federal Action on Plastic Pollution: Progress, Principles, and Priorities*, July 2024, https://www.whitehouse.gov/wp-content/uploads/2024/07/Mobilizing-Federal-Action-on-Plastic-Pollution-Progress-Principles-and-Priorities-July-2024.pdf.

d. United Nations Environment Programme, *Turning Off the Tap: How the World Can End Plastic Pollution and Create a Circular Economy*, 2023, https://wedocs.unep.org/bitstream/handle/20.500.11822/42277/Plastic_pollution.pdf.

e. America's Plastic Makers and American Chemistry Council, *5 Actions for Sustainable Change: A Plan for Congress to Accelerate a Circular Economy for Plastics*, July 2021, https://plasticmakers.org/wp-content/uploads/2022/07/5-Actions-for-Sustainable-Change.pdf.

Among these wide-ranging policy options, several are cited by most or all of the selected publications, suggesting some level of agreement among stakeholders about the potential effectiveness or importance of adopting these options. (Not all stakeholders necessarily agree on all of these options or how they might be specifically implemented.) They include the following:

- **Conducting lifecycle assessments (LCAs) of plastic products and potential alternatives to improve understanding of the health, environmental, social, and economic impacts of products across their lifespan.** LCAs are tools to help identify and assess the environmental and other potential impacts of a product or material throughout its lifecycle. Entities broadly supported the use of LCAs to assess the impacts of various materials (e.g., plastics, steel, aluminum, glass, textiles, wood, paper) and help inform policies and decisionmaking. Some entities suggest these may be used to identify potential alternatives (e.g., different types of plastic, including biobased; reusable products; products made from other materials such as glass, metal, or paper), while reducing the risk of adopting alternatives that have unintended consequences. Examples of unintended consequences include higher water or energy use, higher GHG emissions, or other trade-offs, such as increased food waste. Some entities also suggest that LCAs may be used to consider the environmental impacts of various post-use disposal methods.
- **Adopting policies to ensure the federal government purchases more sustainable plastics.** This could include aiming to reduce single-use plastic across the federal government, or revising government purchasing criteria to shift government purchasing to products that have recycled content or can be reused. Most entities supported this option in their publications, although this was not identified by industry groups.
- **Establishing recycled content standards.** Some entities suggest establishing recycled content standards, such as a specific minimum percentage for various plastic product types (e.g., for packaging or for durable plastics). Some suggest these should be set nationally, while some suggest setting them globally. Some argue for a more stringent approach that would establish mandatory minimum requirements for recycled content, while others discuss recommended minimum recycled content in products as an option. Some stakeholders suggest specific percentages for recycled content by a certain date (e.g., 30% recycled plastic in plastic packaging by 2030), while others suggest exploring and determining the requirements.
- **Establishing standardized plastic labeling.** Standardized plastic labeling may include labels that help consumers sort waste for recycling, or labels that demonstrate compliance with any established recycled content standards. Some suggest these standards be established nationally, while others advocate that they be harmonized globally.
- **Establishing extended producer responsibility (EPR).** EPR is an environmental policy approach that gives producers financial or physical responsibility for a product's entire lifecycle, including the treatment or disposal of post-consumer products. Entities broadly support some level of producer responsibility system, although they vary as to the extent of these programs. For example, the plastics industry supports a national producer responsibility system for consumer packaging that helps fund infrastructure, encourages innovation, and increases recycling. OECD notes that EPR has been implemented to increase

recycling rates in a range of countries and across a diverse array of products, including packaging, batteries, cars, electronics, and tires.[243] At the federal level, EPA advocates for a study to assess the effectiveness of EPR in achieving circularity goals, and the IPC identifies EPA as the appropriate lead in developing "recommendations for a national EPR initiative that allows states, Tribes, local governments, and territories to develop approaches best for them, provides a vision for a harmonized national system and goals for plastic waste management, and aims to level the playing field for producers across all states and territories."[244]

- **Supporting the development, deployment, and investment in technologies and infrastructure for solid waste collection, sorting, and recycling, including increasing capacity.** Entities broadly agreed on the need to improve infrastructure, and access to such infrastructure, for solid waste collection, sorting, and recycling. Most entities advocate for the need for financial investments to accomplish this enhanced capacity.

Congress may consider the adoption of policy options and tools across the lifecycle of plastic, or may opt to focus on specific aspects of the lifecycle. Many of these tools may be applied with varying levels of stringency or scope. Some of these tools may require legislative changes, such as bans on certain plastic products (e.g., single-use plastics) or mandatory minimum requirements for recycled content, while others may necessitate funding to implement effectively (e.g., expanding the capacity of solid waste collection, sorting, and recycling infrastructure). For other options that are available under existing authorities, Congress may opt to oversee the use of those authorities or take steps to urge federal agencies to use the authorities to pursue specific policy options within those authorities (e.g., more fully using authorities under pollution control statutes to address air emissions and discharges to waterways). Finally, Congress may consider its position and options with regard to United States involvement in existing international agreements and ongoing negotiations related to plastic pollution.

[243] OECD, *Policy Scenarios for Eliminating Plastic Pollution by 2040*, p. 125. See also Daniel Kaffine and Patrick O'Reilly, *What Have We Learned About Extended Producer Responsibility in the Past Decade? A Survey of the Recent EPA Economic Literature*, OECD, Working Party on Resource Productivity and Waste, January 2015.

[244] IPC, *Mobilizing Federal Action on Plastic Pollution*, p. 27.

Appendix. Reports Mandated by the Save Our Seas 2.0 Act[245]

Congress passed the Save Our Seas 2.0 Act (SOS 2.0 Act; P.L. 116-224) in 2020, mandating a range of activities across several federal agencies. Among these, Congress directed the Interagency Marine Debris Coordinating Committee, Under Secretary of Commerce, National Institute of Standards and Technology, U.S. Environmental Protection Agency Administrator, Secretary of Transportation, and the Marine Debris Foundation, in some cases individually and others jointly, to complete a series of reports on plastic pollution, recycling, reuse, and waste management (**Table A-1**).

Table A-1. Reports Mandated by Save Our Seas 2.0 Act

(SOS 2.0; P.L. 116-224)

SOS 2.0 Section	Agency Responsible	Report Status
Section 116. Report requirements; petition of attorney general for equitable relief. [Mandates MDF transmit a report to Congress describing activities carried out in that fiscal year.]	MDF	Published in 2023.[a]
Section 125. Report to Congress.	Department of Commerce	Section 125 mandates this report be published following distribution of awards from the "Genius Prize for Save Our Seas Innovations," implemented by the MDF.[b] According to the MDF, this process will begin in 2025.[c]
Section 131. Report on opportunities for innovative uses of plastic waste.	IMDCC and EPA	Published in 2024.[d]
Section 132. Report on microfiber pollution.	IMDCC	Published in 2024.[e]
Section 133. Study on United States plastic pollution data.	NASEM	Published in 2022.[f]
Section 134. Study on mass balance methodologies to certify circular polymers.	NIST	Published in 2022.[g]
Section 135. Report on sources and impacts of derelict fishing gear.	NOAA	Published in 2024.[h]
Section 136. Expansion of derelict vessel recycling.	NOAA	Published in 2023.[i]
Section 137. Incentive for fishermen to collect and dispose of plastic found at sea.	NOAA	Report expected in 2025.[j]

[245] This appendix was authored by Claire M. Jordan, Senior Research Librarian.

SOS 2.0 Section	Agency Responsible	Report Status
Section 301. Strategy for improving post-consumer materials management and water management.	EPA	Two reports fulfill this mandate.[k] The first was published in 2021.[l] The second was published in 2024.[m]
Section 303. Study on repurposing plastic waste in infrastructure.	NASEM; Department of Transportation; EPA	Published in 2023.[n]
Section 304. Study on effects of microplastics in food supplies and sources of drinking water.	NASEM; EPA	EPA deferred to FDA for this report.[o]
Section 305. Report on eliminating barriers to increase the collection of recyclable materials.	EPA	Drafted and through EPA internal expert review. Interagency review expected to begin before the end of 2024.[p]
Section 306. Report on economic incentives to spur development of new end-use markets for recycled plastics.	EPA	Drafted and through EPA internal expert review. Interagency review expected to begin before the end of 2024.[p]
Section 307. Report on minimizing the creation of new plastic waste.	EPA; IMDCC; NIST	Drafted and through EPA internal expert review. Interagency review expected to begin before the end of 2024.[p]

Source: Compiled by Congressional Research Service.

Notes: EPA = U.S. Environmental Protection Agency; FDA = Food and Drug Administration; IMDCC = Interagency Marine Debris Coordinating Committee; MDF = Marine Debris Foundation; NASEM = National Academies of Sciences, Engineering, and Medicine; NIST = National Institute of Standards and Technology; NOAA = National Oceanic and Atmospheric Administration. The Marine Debris Act (33 U.S.C. §1954) established the IMDCC with senior officials from at least six federal departments and agencies to coordinate marine debris research and activities across the federal government in cooperation and coordination with nonfederal entities. Save our Seas 2.0 Act established the MDF as a nonprofit, charitable partner of NOAA. Text in brackets is written by CRS and included for clarity.

a. MDF, *Report to Congress per Save Our Seas 2.0 Act: June 2022 through December 2023*.

b. 33 U.S.C. §4232.

c. MDF, "Genius Price," at https://marinedebrisfoundation.org/genius-prize-landing-page/.

d. EPA, *Report to Congress: Opportunities for Innovative Uses of Plastic Waste*, October 2024.

e. NOAA, Marine Debris Program, EPA, Trash Free Waters Program, *Interagency Marine Debris Coordinating Committee Report on Microfiber Pollution*, June 2024, https://marinedebris.noaa.gov/interagency-marine-debris-coordinating-committee-reports/interagency-marine-debris-coordinating-committee-report-microfiber-pollution.

f. NASEM, *Reckoning with the U.S. Role in Global Ocean Plastic Waste*, 2022, https://nap.nationalacademies.org/catalog/26132/reckoning-with-the-us-role-in-global-ocean-plastic-waste.

g. NIST, *An Assessment of Mass Balance Accounting Methods for Polymers Workshop Report*, February 2023, https://doi.org/10.6028/NIST.SP.1500-206.

h. NOAA, Marine Debris Program, *Sources and Impacts of Derelict Fishing Gear*, August 2024, https://marinedebris.noaa.gov/derelict-fishing-gear/sources-and-impacts-derelict-fishing-gear-0.

i. NOAA, Marine Debris Program, *Recycling Opportunities for Abandoned, Derelict, and End-of-Life Recreational Vessels*, February 2023, https://marinedebris.noaa.gov/abandoned-and-derelict-vessels/recycling-opportunities-abandoned-derelict-and-end-life-recreational-vessels.

j. Testimony of Nancy Wallace, Director, Marine Debris Program, NOAA, in U.S. Congress, House Committee on Natural Resources, *Legislative Hearing on H.R. 746, H.R. 886, H.R. 1245 and H.R. 1419*, hearings, 118th Cong., 1st sess., March 23, 2023, Serial No. 118-10, https://www.govinfo.gov/app/details/CHRG-118hhrg51683/CHRG-118hhrg51683.

k. EPA, "Biden-Harris Administration Announces Latest Steps to Reduce Plastic Pollution Nationwide," press release, April 21, 2023, at https://www.epa.gov/newsreleases/biden-harris-administration-announces-latest-steps-reduce-plastic-pollution-nationwide.

l. EPA, *National Recycling Strategy: Part One of a Series on Building a Circular Economy for All*, November 2021, https://www.epa.gov/circulareconomy/national-recycling-strategy.

m. EPA, "National Strategy to Prevent Plastic Pollution," https://www.epa.gov/circulareconomy/national-strategy-prevent-plastic-pollution.

n. NASEM, *Recycled Plastics in Infrastructure: Current Practices, Understanding, and Opportunities,* 2023, https://nap.nationalacademies.org/catalog/27172/recycled-plastics-in-infrastructure-current-practices-understanding-and-opportunities.

o. EPA provided the following status update to CRS via email communication on October 8, 2024: "Although there have been advancements in microplastic research globally, the state of the science is insufficient to support scientifically rigorous human health and environmental risk assessments. EPA is collaborating with other agencies on methods to collect and evaluate microplastics in surface waters. However, the assessment of microplastics in food and bottled water and other beverages is the responsibility of the Food and Drug Administration."

p. Email communication between CRS and EPA, October 8, 2024.

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