Ocean Conservancy®

Plastics Policy 101

An Introduction to Science-Based Solutions to the Plastic Pollution Crisis

OCEAN CONSERVANCY

Ocean Conservancy is working to protect the ocean from today's greatest global challenges. Together with our partners, we create evidence-based solutions for a healthier ocean and the wildlife and communities that depend on it. For 40 years, we have been on the forefront of tackling one of the ocean's biggest threats, plastic pollution, through organizing the largest cleanup effort in the world, leading novel scientific research on the crisis and successfully advocating for state, national and international policies to prevent plastics from becoming pollution in the first place.

February 2025

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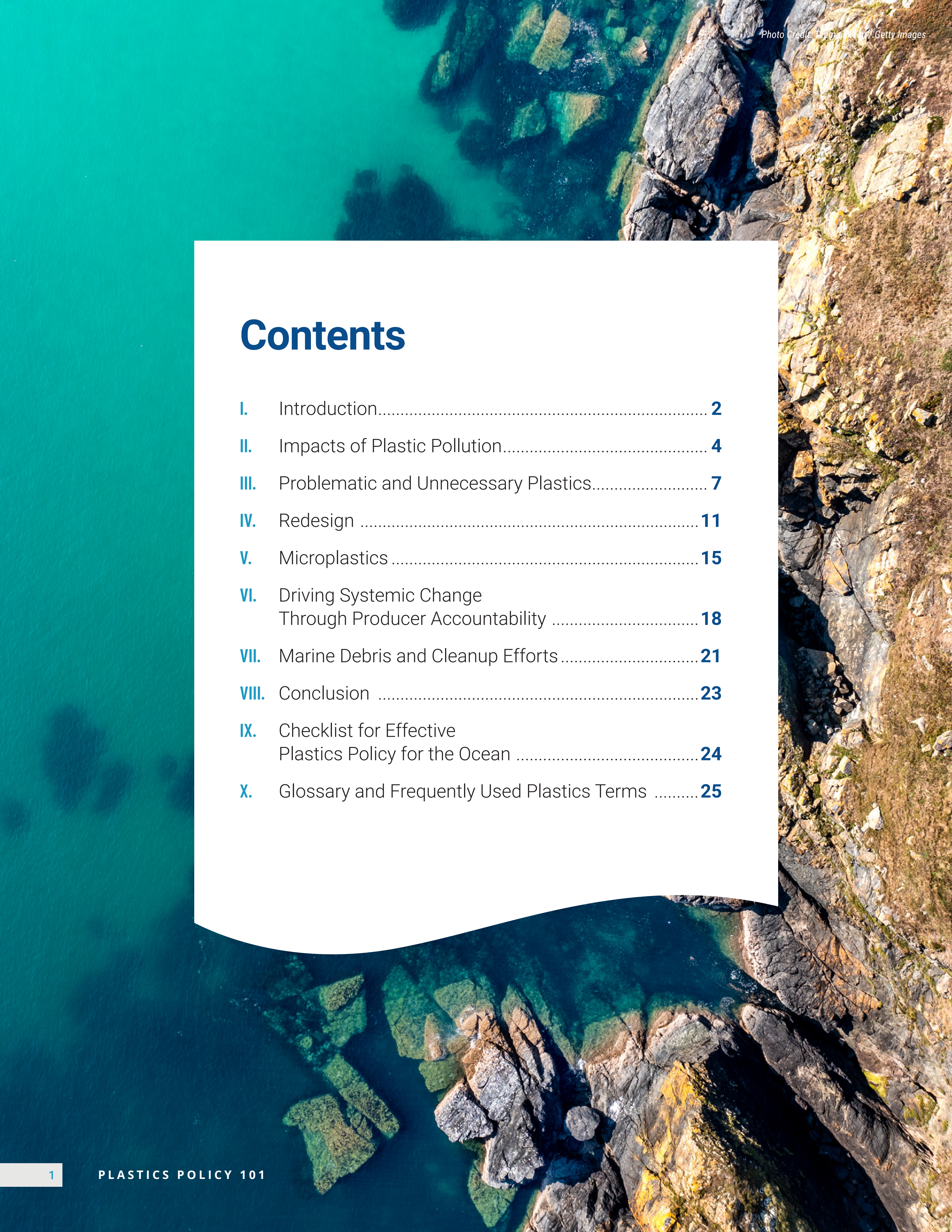

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I. Introduction

Plastic pollution is drawing increasing attention from the public, policymakers and the scientific community. As plastic production has nearly doubled over the last few decades, growing scientific evidence demonstrates the harm of plastic pollution on the environment, economy and communities.

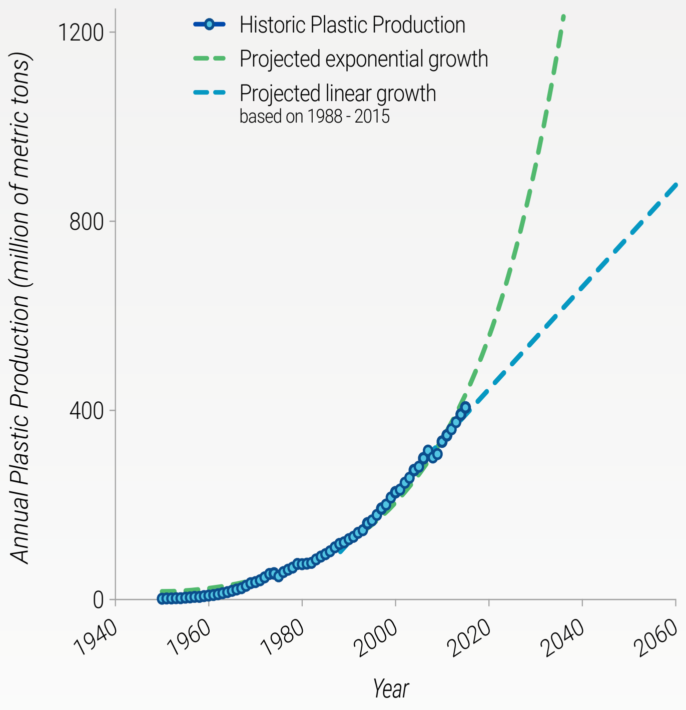

Image modified from Brandon, A.M. & Criddle, C. (2019). *Current Opinion in Biotechnology*.

Models show[1] that to address the plastic pollution crisis we need a comprehensive approach across the full plastics lifecycle that includes:

- Reducing the amount of plastic we produce.
- Better managing the plastics that we do make.
- Continuing to clean up plastics that pollute the environment.

This report is intended to be a primer on plastic pollution and key policy solutions at the federal and state levels in the United States. The plastics lifecycle touches on everything from recycling and waste management policies to food and water supplies and human health. The current plastic pollution crisis cannot be addressed through consumer change alone, and years of voluntary commitments and initiatives from the private sector have not met the scale of change needed. Policy is a powerful tool to scale up these initiatives and create the systemic change needed to address this crisis by bringing together all necessary stakeholders.

The U.S.'s Contribution to Plastic Pollution

Peer-reviewed research by Ocean Conservancy and collaborators found that **the U.S. ranks as high as third** among countries contributing to ocean plastic pollution.[2] The U.S. also generated the most plastic waste overall and the most plastic waste per capita of any country in the world in 2016.[3] The U.S. has both a responsibility and an opportunity to play a leading role in reducing plastic pollution. Americans are broadly concerned about this issue. A study by Ocean Conservancy found that nearly 80% of Americans consider plastic pollution to be the most pressing problem for the health of our ocean.[4] Addressing plastic pollution will provide economic, environmental and human health benefits to communities across the U.S.

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II. Impacts of Plastic Pollution

Over 11 million metric tons of plastic pollution enter the ocean annually.[5] That amounts to more than a garbage truck's worth of plastics entering the ocean every minute. Ocean plastic pollution doesn't just come from beaches and coastal communities. Plastics enter our ocean from rivers, canals and storm drains, and while those may be the direct routes to the ocean, the pollution can start far upstream and inland, eventually making its way to the ocean.

About 40% of annual plastic production is for plastic packaging, and these lightweight and single-use plastic items contribute an outsized amount to pollution.[6] Since 1986, Ocean Conservancy's International Coastal Cleanup® (ICC) volunteers have removed nearly 410 million pieces of debris from beaches and waterways, all while collecting data on the kinds of items found.[7]

PLASTIC POLLUTION BY THE NUMBERS

11 million
metric tons of plastic pollution enter the ocean annually.[8]

Americans may consume up to
3.8 million
microplastics each year just from the proteins we eat.[9]

Plastic pollution is estimated to cost up to
$2.5 trillion
to the global economy every year.[10]

Across the world and over the course of nearly 40 years, many of the same items consistently top the list of what ICC volunteers collect: single-use plastic packaging and foodware .

Once they enter the ocean or other ecosystems, plastics harm wildlife, disrupt ecosystem processes and enter the food chain and water supplies. Plastics in the ocean reduce the ecosystem services the ocean can provide.[11] They are also mistaken as food by wildlife or can entangle them with lethal consequences. From plankton to whales, nearly 1,300 species across ocean ecosystems have been documented to ingest plastics—a number that continues to rise.[12] This includes every family of marine mammals, every family of seabirds, every species of sea turtles and over 750 species of fish. Plastics attract bacteria and can concentrate legacy contaminants (e.g., DDT) and other chemical contaminants (e.g., pharmaceuticals and heavy metals) from the environment up to a million times higher than surrounding seawater,[13] posing a contamination risk to marine predators and human seafood consumers.[14] Larger plastic items can break apart, resulting in microplastic and nanoplastic particles.

There is increasing evidence that plastics impact human health from their production through use and disposal and can release toxic chemicals into the environment and people, including additives that disrupt endocrine function and increase risks of premature births, infertility, obesity, cardiovascular and renal disease and cancers.[15] Chemicals in plastics cost an estimated $249 billion in increased healthcare costs in the U.S. in 2018.[16]

Microplastics now contaminate the human body due to inhalation of frequently contaminated air and consumption of foods and beverages such as drinking water, milk, beer, processed foods, meats and more.[17] A 2024 study led by Ocean Conservancy and University of Toronto researchers found microplastics in 88% of protein samples tested, including seafood, pork, beef, chicken, tofu and plant-based meat alternatives.[18] This study found that Americans may consume up to 3.8 million microplastics each year just from the proteins we eat.

TOP TEN

Plastic Items Collected by ICC Volunteers in the U.S. (1986-2023)[19]

1	**63,207,042**	**Cigarette Butts**
2	**30,206,931**	**Food Wrappers** *(Candy, Chips, etc.)*
3	**24,344,647**	**Beverage Bottles**
4	**23,802,977**	**Plastic Bags** *(Grocery and Other)*
5	**18,600,786**	**Bottle Caps**
6	**15,466,088**	**Straws, Stirrers**
7	**9,414,312**	**Foam Foodware** *(Take Out Containers and Cups, Plates)*
8	**8,026,935**	**Hard Plastic Cups, Plates**
9	**7,317,594**	**Lids**
10	**6,748,559**	**Forks, Knives, Spoons**

Excluding cigarette butts, these ten items make up one out of every six plastic items used each year in the United States.[20]

In humans, microplastics have been found in blood, lung tissue, placentas, the brain and testicles, among other places.[21] Studies have found preliminary evidence that plastics in the human body can cause inflammation, oxidative stress and DNA damage, raising concerns about potential impacts to human health.[22]

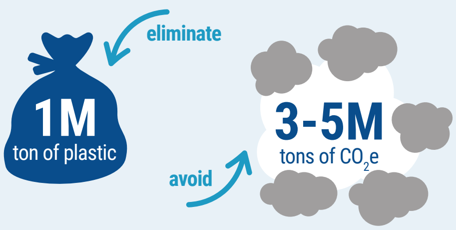
Plastic pollution also impacts local economies. One study found that 90 west coast communities across California, Oregon and Washington spent more than $520 million annually to address litter and prevent trash from entering the ocean and waterways.[23] Another found that doubling the amount of marine debris on Alabama beaches would result in $113 million lost in tourism spending and 2,200 fewer jobs.[24] Taking into account ecosystem damages, tourism losses, impacts to fisheries and the shipping industry and other economic benefits of the ocean, plastic pollution is estimated to cost between $500 billion and $2.5 trillion to the global economy every year.[25]

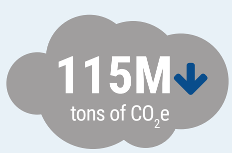
Plastic Action is Climate Action

Plastics are made from and powered by fossil fuels. The proper management of plastic waste and investments in alternative materials and delivery systems can also be a key driver in decreasing our dependence on fossil fuels. The plastics sector is responsible for 3-4% of global greenhouse gas emissions, which is projected to triple by 2050.[26]

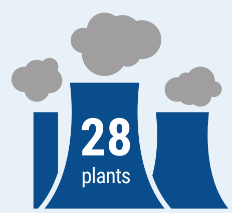
Policies to reduce single-use plastics also help fight climate change. For example, California's Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54) created a new extended producer responsibility program for packaging and single-use plastic foodware, including requirements to reduce the amount of single-use plastics used. Ocean Conservancy scientists estimate the source reduction policy in SB 54 alone will eliminate 23 million tons of single-use plastics over the next 10 years. This reduction of plastics will result in avoiding approximately 115 million tons of CO_2e emissions over ten years, the equivalent of shutting down 28 coal-fired power plants.

For every **1 million ton of plastic** eliminated though SB 54, **5 million fewer tons of CO_2e** will be emitted into the atmosphere.

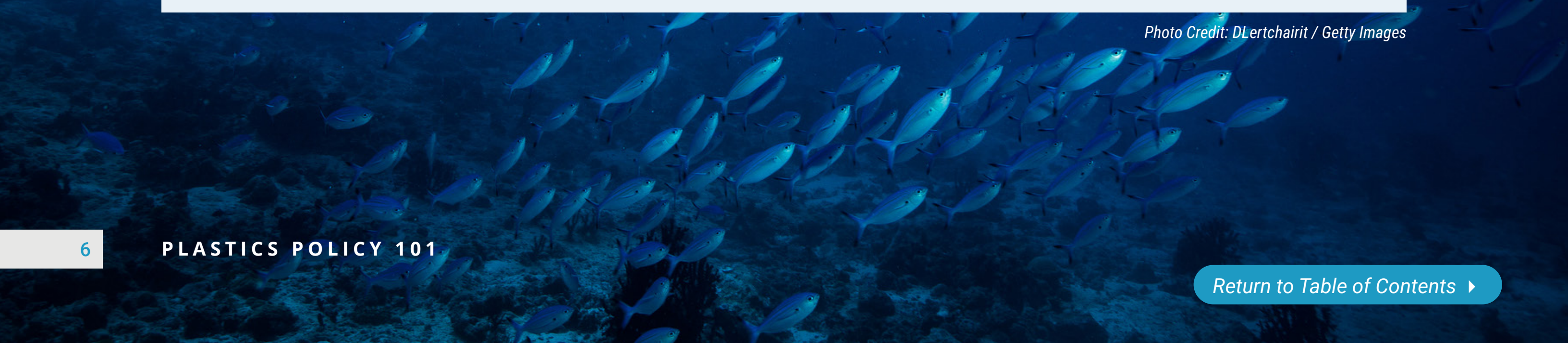




In total, SB 54 will lead to **115 million fewer tons of CO_2e** emitted.



That's the equivalent of shutting down **28 coal-fired power plants**.



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III. Problematic and Unnecessary Plastics

KEY TAKEAWAYS

Many single-use plastics can be easily eliminated or replaced by reusable alternatives. Single-use plastics are also more likely to end up as pollution and often contaminate recycling streams. Ocean Conservancy estimates that phasing out just five single-use plastic items—cigarette butt filters, straws, cutlery, bags and foam foodware—would result in 450 billion fewer plastic pieces being used in the United States each year.[27]

POLICY SOLUTIONS

- **Phase-outs, by request laws and fees.**
- **Government procurement standards.**

While some single-use plastic items may be recycled, the majority end up in landfills, incinerators or the environment.[28] These items are designed to be used for just a few minutes, but when they end up in the environment, they can persist indefinitely where they continue breaking into smaller micro- and nanoplastics. On average, plastic bags are used for only 12 minutes before being thrown away,[29] and they are not readily recyclable in curbside programs. They are also among the most common items found polluting beaches and are among the deadliest forms of plastic pollution for wildlife.[30]

Not all single-use plastics are equally problematic or avoidable. For example, medical applications such as personal protective equipment are highly important and hard to replace, whereas single-use plastic bags are easily avoided with reusable or paper bags. While there is a clear need to reduce the use of single-use materials overall, policies that focus on the most problematic and avoidable plastics first can have an immediate positive benefit for our ocean, environment and waste management systems.

For more information on approaches to eliminating problematic and unnecessary plastics, see Ocean Conservancy's Report, Charting a Course to Plastic Free Beaches: Part 1.

Business Support for Eliminating Unnecessary and Problematic Materials

The U.S. Plastics Pact, a consortium of businesses, government agencies and nonprofits with expertise throughout the plastics lifecycle have committed to eliminating certain problematic and unnecessary materials. The U.S. Plastics Pact defines "Problematic or Unnecessary Materials" as:

> *"Plastic packaging items, components, or materials where consumption could be avoided through elimination, reuse or replacement and items that, post-consumption, commonly do not enter the recycling and/or composting systems, or where they do, are detrimental to the recycling or composting system due to their format, composition, or size."*[31]

The U.S. Plastic Pact's Problematic and Unnecessary Materials list includes polystyrene, expanded polystyrene, polyvinyl chloride (PVC), intentionally added per- and polyfluoroalkyl substances (PFAS), certain multi-material packaging, and cutlery, stirrers and straws that are not reusable, recyclable or compostable and are ancillary to a primary container (like plastic cutlery provided with a prepared salad).[32]

Phase-outs, By Request Laws and Fees

For plastics that are unnecessary or readily replaced by reusable alternatives, targeting specific items for elimination or reduction can be an effective approach to reducing plastic pollution. For example, a recent analysis by Ocean Conservancy scientists observed a 29% reduction in plastic grocery bags found on beaches following an increase in state laws aimed at reducing plastic bag use.[33] Some common approaches to regulating problematic or unnecessary plastics are:

Phase-Outs or Bans

Prohibiting the sale of a specific product.

Phase-outs of specific single-use plastics can provide an effective approach for items that are not needed or can be easily replaced with reusable or more sustainable options. Items like single-use plastic bags and expanded polystyrene foodware, colloquially known by the brand name Styrofoam, are examples of items where phase-outs have been effective at reducing plastic pollution. Ocean Conservancy research found a 65% reduction in plastic foam foodware pollution collected by ICC volunteers from beaches and waterways in Maryland after its phase-out in the state.[34]

To learn more about state efforts to phase out plastic foam foodware see Ocean Conservancy's report, [What the Foam?! How to Keep Plastic Foam Foodware Out of Our Ocean](#).

By Request Laws

Requiring that certain items, like straws or cutlery, be provided to customers only upon request.

This policy approach works well for items that are sometimes needed but, more often than not, can be avoided. For example, Washington state law requires that businesses confirm that customers want items like straws, utensils, beverage lids or condiment packaging rather than providing them automatically.[35] Although in many cases, single-use straws can be avoided through drinking directly from a beverage container or using a reusable straw, some people—including people with disabilities or certain medical conditions—may need straws. "By request" laws allow them to retain access to those items while limiting their unnecessary use by others.

Fees

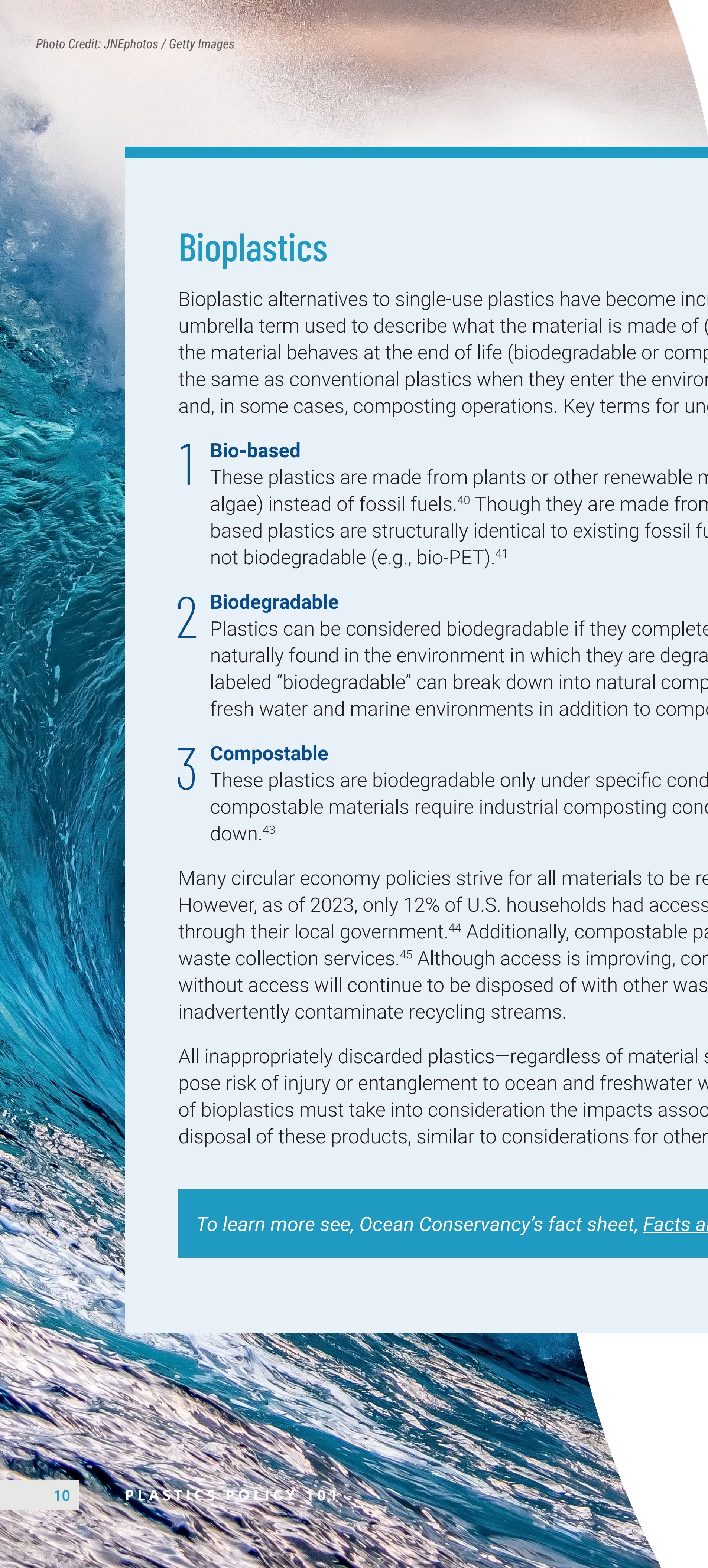
Charging additional fees upon purchase for a product.

Fees can be an effective tool to drive behavior change by disincentivizing the use of certain products. Fees are often associated with plastic bag policies as an approach to decrease single-use bag use. In some cases, consumers are charged a fee per single-use plastic bag provided by a retailer. More recently, based on data gathered from previous bag policies, states have begun shifting to policies that prohibit single-use plastic carryout bags and place a fee on paper bags to encourage consumers to bring their own reusable bag and further disincentivize single-use paper bag use. Colorado and California's plastic bag laws are both examples of this approach.[36]

Government Procurement Standards

Government procurement policies can play an important role in reducing unnecessary waste, and potential harm, created by products they purchase with taxpayer dollars and in supporting markets for more sustainable products. State and local governments have taken action, including Illinois, which prohibits state agencies from procuring disposable polystyrene foam food service containers,[37] and Massachusetts, which prohibits state agencies from purchasing single-use plastic bottles.[38] Local level action is also underway, including Miami-Dade County in Florida which has adopted a policy to eliminate single-use plastics, including polystyrene, in county facilities.[39]

Photo Credit: Eco Pazifico



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Bioplastics

Bioplastic alternatives to single-use plastics have become increasingly common. "Bioplastic" is an umbrella term used to describe what the material is made of (biologically derived material) or how the material behaves at the end of life (biodegradable or compostable). Many of these products act the same as conventional plastics when they enter the environment and can contaminate recycling and, in some cases, composting operations. Key terms for understanding bioplastics include:

1. **Bio-based**
These plastics are made from plants or other renewable materials (e.g., agricultural waste, algae) instead of fossil fuels.[40] Though they are made from renewable materials, some bio-based plastics are structurally identical to existing fossil fuel-based plastics and therefore are not biodegradable (e.g., bio-PET).[41]

2. **Biodegradable**
Plastics can be considered biodegradable if they completely break down into compounds naturally found in the environment in which they are degrading within one year.[42] Not all plastics labeled “biodegradable” can break down into natural compounds in all environments (e.g., soil, fresh water and marine environments in addition to compost).

3. **Compostable**
These plastics are biodegradable only under specific conditions (e.g., a compost pile). Many compostable materials require industrial composting conditions (higher heat, mixing) to break down.[43]

Many circular economy policies strive for all materials to be reusable, recyclable or compostable. However, as of 2023, only 12% of U.S. households had access to residential food waste collection through their local government.[44] Additionally, compostable packaging is not accepted by all food waste collection services.[45] Although access is improving, compostable materials in locations without access will continue to be disposed of with other waste in landfills or incinerators, or could inadvertently contaminate recycling streams.

All inappropriately discarded plastics—regardless of material source or end-of-life properties—pose risk of injury or entanglement to ocean and freshwater wildlife. Policies encouraging the use of bioplastics must take into consideration the impacts associated with the production, use and disposal of these products, similar to considerations for other plastics.

To learn more see, Ocean Conservancy’s fact sheet, Facts and Figures: Defining Plastics.

Photo Credit: Kyle McBride

IV. Redesign

KEY TAKEAWAYS

Single-use plastics are often incompatible with recycling systems by design because of material choices or toxic additives used in manufacturing. Misleading labeling and greenwashing confuse consumers and contribute to contamination in recycling systems. Consistent and responsible end markets are necessary to make recycling economically feasible and ensure that postconsumer materials can be turned into new products. To reduce the impacts of the materials we use every day, we need to redesign materials to contribute to a circular economy. This includes not only addressing barriers to recyclability but also shifting from single-use to reusable and refillable products that will further reduce environmental impacts and save businesses and local governments money.

POLICY SOLUTIONS

- **Scale up reuse and refill infrastructure.**
- **Design products for recycling.**
- **Establish postconsumer recycled content (PCR) requirements.**
- **Decrease toxic additives.**
- **Require truth in labeling.**

In addition to eliminating unnecessary or problematic plastics, we also need to redesign products and systems to use fewer plastics. This is especially important for items like food wrappers that are among the most common items found on beaches by ICC volunteers but remain necessary to safely deliver products to consumers. Unfortunately, many single-use plastics and packaging items are not readily recyclable and can be labeled in a way that confuses consumers, leading to greenwashing and a loss of consumer confidence. This can also lead to contamination in recycling streams, which in turn costs local governments and taxpayers in lost productivity of those systems. At the same time, the shift from virgin plastic to postconsumer recycled content has been slowed by subsidized virgin plastic prices. To address these challenges, policies are needed to catalyze innovation and create consistency for businesses and consumers to reduce, reuse and redesign packaging and other single-use plastics.

To learn more about the waste hierarchy and how it can be applied to plastic pollution see Ocean Conservancy's report, Charting a Course to Plastic Free Beaches: Part 2.

The Ocean Plastic Pollution Reduction Hierarchy

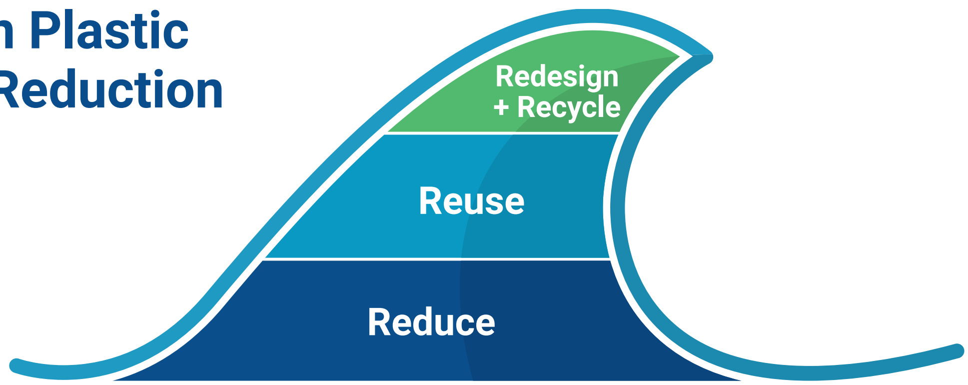

Photo Credit: cmspic / Getty Images

Scale Up Reuse and Refill Infrastructure

Expanding reuse and refill infrastructure is essential to reducing plastic pollution while avoiding substituting one single-use problem for another. Reusable food serviceware has been shown to have more environmental benefits over single-use items, even accounting for the impacts of washing.[46] They also save businesses money compared to purchasing single-use items and save both businesses and local governments money on waste management costs.[47] In a review of one program, shifting to reuse for on-site dining saved small businesses between $3,000 and $22,000 and eliminated up to 225,000 packaging items per business annually.[48]

Policies to support reuse and refill systems can come in many forms, including;

- **Implementing mandatory reuse, refill and source reduction targets** within extended producer responsibility (EPR) and deposit return system (DRS) programs (see Section VI for more on EPR and DRS).
- **Requiring reusable items for dine-in** customers at food service establishments.
- **Financially supporting businesses** to alleviate start-up costs for purchasing reusable materials and investing in washing systems.
- **Updating health codes** to allow consumers to bring their own containers in settings like coffee shops or bulk grocery.
- **Supporting expansion of water refill stations**, including in government buildings, hotels, airports and other public settings.

Demonstrating Reuse Success in Stadiums and Large Venues

Adopting reuse in closed systems like events and venues offers a near-term and impactful solution to reduce single-use plastics and educate consumers on reuse. These environments where food and beverages are consumed on site are an ideal setting for reuse systems as containers can be easily collected, washed and reused without logistical challenges like transportation or contamination from other single-use plastics. Starting in these spaces can build momentum for broader adoption by demonstrating cost savings, piloting new systems and increasing consumer familiarity. For example, an average stadium that hosts 300 events a year uses 5.4 million single-use cups, creating nearly 64 tons of plastic waste. Switching to reusable cups could avoid about 98% of that waste.[49]

Design Products for Recycling

The most effective way to improve our ability to recycle plastics is to ensure the plastics we use are designed to be recycled. It is currently not economically or technologically practical to recycle many plastics because of the way they are designed. For example, the light and flexible characteristics of food wrappers clog sorting machinery in recycling facilities.[50] They are also often composites made of multiple layers of different materials that cannot be separated for recycling.[51] In another example, plastic beverage bottles are often made of highly recyclable polyethylene terephthalate (PET), but coloring or bottle labels can prevent them from being readily recycled back into water bottles. Efforts like the U.S. Plastics Pact Problematic and Unnecessary Materials list and the APR Design® Guide for Plastics Recyclability (from the Association of Plastic Recyclers)[52] are driving some producers to redesign their products for recyclability. However, policy plays a key role in driving this change and leveling the playing field for producers. For example, Minnesota's EPR law, the Packaging Waste and Cost Reduction Act, requires all packaging, food packaging and paper products to be refillable, reusable, recyclable or compostable by 2032.[53]

Establish Postconsumer Recycled Content (PCR) Requirements

As recycling systems improve and more products move through those systems, consistent and responsible end markets are needed to make recycling economically feasible and to ensure PCR is returned to the market. Although many companies have begun incorporating PCR into their supply chains, mandatory PCR minimums create a level playing field for producers, help drive the cost of PCR to compete with virgin plastic resin prices, incentivize the recovery of materials from consumers to be turned into PCR and, ultimately, decrease the need for virgin fossil-fuel derived plastic. Recent research found that of eight policy interventions modeled, minimum PCR requirements resulted in the largest decrease in mismanaged plastic waste and virgin plastic production.[54] For these policies to be effective, it is important that they are focused on postconsumer materials rather than pre-consumer materials like industrial scrap or business-to-business materials because the postconsumer material mismanagement is largely what drives plastic pollution and challenges in the recycling system. California, Washington, New Jersey and Maine have laws with PCR requirements for beverage bottles and, in some cases, additional products like trash bags, reusable carryout bags and cleaning product containers.[55]

To learn more about PCR requirements, see Ocean Conservancy's report, Recommendations for Recycled Content: Requirements for Plastic Goods and Packaging.

Decreasing Toxic Additives

Plastics contain a variety of chemical additives to give them the final characteristics we are familiar with. On average, plastics contain about 7% chemical additives by weight.[56] These additives are used to help in the manufacturing process (e.g., plasticizers that make it easier to shape and form products) or to improve certain qualities of the final plastic products (e.g., flame retardants, stabilizers and colorants). Many of these additives are toxic and are known to be associated with negative and severe human health impacts.[57] While it's been reported that there are over 13,000 chemicals associated with the plastics sector, there is little to no information or required reporting on chemicals used in specific plastics.[58] Many of these same toxic additives can lead to the inability to effectively recycle or reuse these plastics. Along with recyclability design requirements, restrictions on toxic additives based on scientific evidence and increased transparency can help protect communities and the environment from exposure to dangerous chemicals while offering businesses a consistent standard for manufacturing.

Require Truth in Labeling

The current lack of standardized recycling, composting and reuse labeling across the country leads to consumer confusion and can contribute to contamination in the recycling and composting systems. A national survey found that 67% of consumers looked at the label on a product or packaging before discarding it, emphasizing the importance of accurate and accessible information.[59] Currently, most plastics are labeled with a resin identification code (RIC), a number 1 to 7 that indicates the type of plastic, which is placed inside the chasing arrow recycling symbol. The Plastics Industry Association (at the time called The Society of the Plastics Industry), championed laws requiring this labeling in the 1980s, resulting in its passage in 40 states.[60] Because the chasing arrows symbol is widely understood by the public as an indication that the material can be recycled, its inclusion on packaging can lead to confusion. Four states have repealed the requirement to include the chasing arrow symbol. California has gone the furthest to ensure truth in labeling by prohibiting the use of the chasing arrow symbol and only allowing recycling claims if products meet certain criteria.[61]

Resin Identification Codes (RICs) of Common Plastics

TYPICALLY RECYCLABLE*

RIC	PLASTIC TYPE	EXAMPLE PRODUCTS
1 PET	**Polyethylene Terephthalate**	Water bottles, jars, caps
2 HDPE	**High-Density Polyethylene**	Shampoo bottles, milk jugs
5 PP	**Polypropylene**	Yogurt cups, takeout containers

TYPICALLY NOT RECYCLABLE

RIC	PLASTIC TYPE	EXAMPLE PRODUCTS
3 PVC	**Polyvinyl Chloride**	Food wrap, trays, pipes
6 PS	**Polystyrene**	Foam cups and clamshells, hard packaging
7 OTHER	**Other**	5-gallon water bottles, food wrappers

**Refers to whether example products are typically recyclable through curbside recycling programs. While accepted material for curbside recycling varies widely by location, these plastics are more commonly accepted by curbside recycling programs than other plastic types.*

Photo Credit: Andrei / Adobe Stock

V. Microplastics

KEY TAKEAWAYS

Microplastics are found throughout the environment and in human bodies. Microplastics can be created intentionally or through shedding and breakup of larger items. Microplastics are an increasingly concerning form of plastic pollution with wide ranging implications for human health and natural resources, requiring a combination of interventions throughout their lifecycle.

POLICY SOLUTIONS

- **Require microfiber filtration on washing machines.**
- **Phase out intentionally added microplastics.**
- **Prevent releases of pre-production plastic pellets.**
- **Invest in research on microplastics and necessary infrastructure updates.**

Microplastics have been found nearly everywhere scientists have looked for them. In the environment, they've been found in the deepest part of the ocean to the tops of mountains. They are in our air, water, food and our bodies, and increasing scientific evidence is raising concerns about their impacts on human health and the environment (for more see Section I). Microplastics come from a wide variety of sources. Primary microplastics are manufactured to be smaller than 5 millimeters, such as microbeads, glitter, foam beads and plastic pellets. Secondary microplastics are derived from the deterioration of larger plastics, such as single-use plastics that break up into smaller pieces in the environment or microfibers that shed from textiles. The scale and variety of microplastic pollution requires a combination of policy approaches. Scientific understanding of microplastics is quickly expanding, but there are some sources that we already know enough about to act on now.

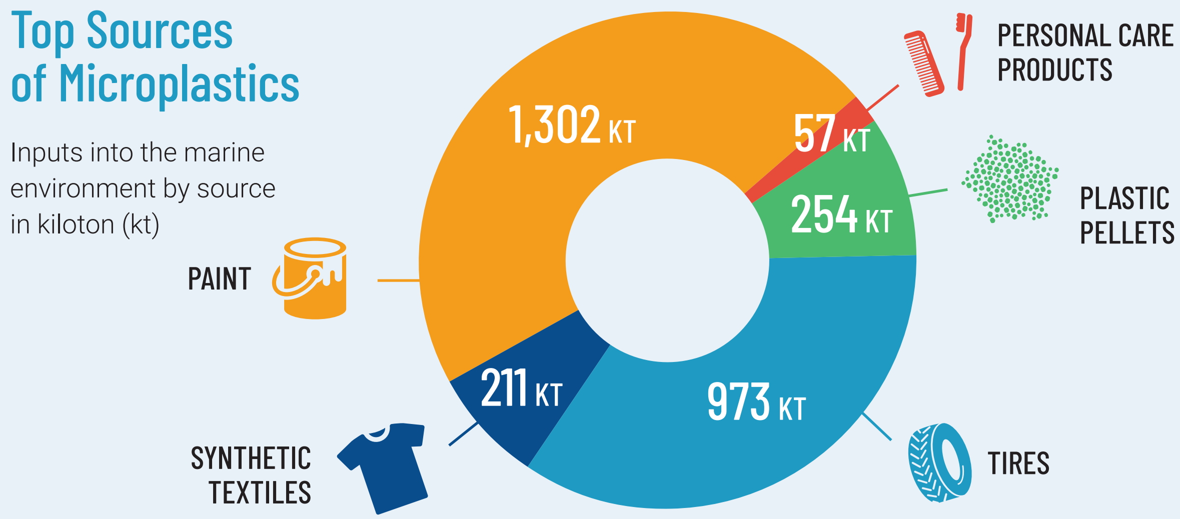

Image modified from Thompson, R.C. et al. (2024). Science.

Require Microfiber Filtration on Washing Machines

Microfibers are among the most common forms of microplastics, and preliminary research shows that they may be the most harmful.[62] Microfibers can be shed from a variety of products, including textiles, carpeting, wet wipes, cigarette filters and fishing gear.[63] Laundering of textiles is a major source of microfiber pollution in the environment. An estimated 5.6 million metric tons of synthetic microfibers were emitted from washing clothes between 1950 and 2016—the equivalent of 28.2 billion t-shirts—with nearly half emitted during the last decade of that period alone.[64] A single load of laundry can release up to 18 million microfibers.[65] Installing microfiber filters on washing machines is a proven and cost-effective solution that can help address this source of microplastics in the environment. There are microfiber filters on the market today that have been shown to reduce microfiber emissions up to 90%.[66] Based on pilots at the city level, researchers estimate that for a city with one million households, effective washing machine microfiber filters could capture up to four quadrillion microfibers per year.[67] That's equivalent to 47 million t-shirts!

To learn more see, Fibers to Filters: A Toolkit for Microfiber Solutions, coauthored by Ocean Conservancy, The 5 Gyres Institute and The Nature Conservancy.

Phase Out Intentionally Added Microplastics

In 2015, the bipartisan federal Microbead-Free Waters Act was signed into law, prohibiting plastic microbeads in rinse-off cosmetics (e.g., face wash and toothpaste).[68] The Microbead-Free Waters Act was an important step in eliminating a source of microplastic pollution across the United States. However, microplastics are intentionally added to a suite of products that are still widely used, such as makeup, fertilizers, cleaning detergents and paint. In September 2023, the European Commission adopted a restriction on certain intentionally added microplastics, including infill on artificial sport surfaces, cosmetics, detergents, fabric softeners, glitter, plant products, toys and medical devices.[69] California's 2022 Statewide Microplastics Strategy also recommends an expansion of the state's microbead ban to include microplastics that are intentionally added to certain consumer products.[70] The most effective way to reduce the flow of intentionally added microplastics into the environment is through policies that prevent their use in the first place.

Prevent Release of Pre-Production Plastic Pellets

Pre-production plastic pellets, also known as "nurdles," are the base material that is used for any plastic product. They are typically 3-to-5 millimeter oval or cylindrical pieces of plastic resin that are used to form larger plastics through manufacturing processes. However, these plastic pellets are frequently released into the environment where they pose many of the same threats associated with other microplastics. Pre-production plastic pellets have been detected in the environment for decades. They have been documented along U.S. coastlines since the 1990s.[71] These pellets are found throughout the ocean globally, including remote areas like Antarctica, due to their small size and ability to move long distances through ocean currents.[72] Pre-production plastic pellets are frequently consumed by marine life, including fish, seabirds and sea turtles—which mistake them for prey—and can lead to starvation. California is the only U.S. state that has directly regulated pollution from plastic pellets through waste discharge, monitoring and reporting requirements, along with best practices implementation.[73] In other states, plastic pellets remain largely unregulated, leading to gaps in enforcement authorities and a patchwork of prevention, monitoring and cleanup efforts.

Invest in Research on Microplastics and Necessary Infrastructure Updates

Scientific understanding of microplastic pollution is quickly evolving. While some sources of microplastics can be addressed through near-term solutions like improved washing machine filtration or preventing plastic pellet pollution, additional research is needed to identify the scale and impacts of microplastic pollution to inform further policy action. In 2022, California adopted a standard methodology for testing for microplastics in drinking water and a requirement to test and report on microplastics in drinking water for four years.[74] Federally, the Bipartisan Infrastructure Law appropriated funds through FY26 for the Clean Water State Revolving Fund to address emerging contaminants, including microplastics.[75] Policies like these that support increased research and a better understanding of risks associated with microplastics are critical to understanding the scale and scope of this challenge and in developing science-based policies to address it.

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VI. Driving Systemic Change Through Producer Accountability

KEY TAKEAWAYS

Under current U.S. waste management systems, local governments and taxpayers pay for the disposal of plastics and other solid waste but have very little control over the products that are put on the market. With over 9,000 separate recycling systems across the U.S., confusion over what is recyclable leads to a lack of consumer confidence and increased contamination in recycling systems. Producers face challenges accessing quality recycled content to use in their products at a cost that can compete with subsidized virgin plastic and in accurately labeling products for recycling across different markets with varying recycling capabilities. Policies like extended producer responsibility hold producers financially accountable for waste created by packaging and single-use plastics that they put on the market, shifting financial burdens from local governments and taxpayers and driving producers to make less wasteful products and improve material recovery and environmental outcomes.

POLICY SOLUTIONS

- **Extended producer responsibility (EPR).**
- **Deposit return systems (DRS).**
- **Virgin plastic fees.**

In 2018, 35.7 million tons of plastics were generated in the U.S. municipal solid waste system.[76] There are over 9,000 separate recycling systems across the U.S., all of which operate under their own rules.[77] They also have a high cost of operation and face challenges such as lack of sustained funding and contamination due to consumer confusion and misunderstanding of recycling systems. In most U.S. states, local governments and taxpayers bear the cost of updating systems and equipment to accommodate the increasing variety of packaging and materials that enter their operations, with no control over the design or labeling of those materials. Producers face challenges recovering the materials used in their products to source recycled content at a cost that can compete with subsidized virgin plastic prices and in accurately labeling their products for recycling and acceptance across widely varying recycling systems. An increasing focus in plastics policy is shifting the control and financial responsibility to producers for the end of life of their products—saving local governments and taxpayers money and driving producers to achieve greater efficiency in product design, material recovery and environmental outcomes.

Extended Producer Responsibility (EPR)

Extended producer responsibility is a tried and tested policy that has been implemented for decades in other developed countries around the world, including Canada, the European Union, Japan, Chile and Australia. EPR programs for packaging have gained momentum in the U.S. as a policy option to hold producers financially responsible for the environmental impacts of their packaging. Under an EPR program for packaging, producers work together through a producer responsibility organization to meet certain environmental outcomes such as reduction, reuse, recycling and redesign requirements. These policies can drive producers to factor environmental outcomes into their bottom lines by requiring producers to pay for all the packaging they put on the market based on recyclability and other environmental design decisions. In recent years, Maine, Oregon, Colorado, California and Minnesota have passed EPR laws for packaging to reduce pollution from single-use plastics and other packaging waste. While the laws vary state by state, they all require producers to join a producer organization to cover the costs of managing materials they put on the market and establish goals to improve recycling. Maryland and Illinois have also passed laws to conduct needs assessments to begin the process of developing an EPR system. Nearly a dozen other state legislatures across the country have considered EPR bills in recent years including Kentucky, Michigan, New York, Tennessee and Washington.

Deposit Return Systems (DRS)

Deposit return systems for beverage containers (also known as bottle bills or recycling refunds) have been widely used in the U.S. since the 1970s. DRS policies require a deposit, charged on the purchase of a beverage container, that is then returned to the consumer when the container is returned to drive higher recycling rates of beverage containers. California, Connecticut, Hawaii, Iowa, Maine, Massachusetts, Michigan, New York, Oregon and Vermont each have a DRS program in place.[78] Implementing beverage container DRS programs has been shown to result in higher recycling rates for beverage containers and to have immediate environmental benefits, including litter reduction.[79] By keeping beverage containers separate from other recyclables, DRS programs also make it easier to process beverage containers through a reuse program or to recycle them back into beverage containers or other food packaging.

Source Reduction in EPR Policies

Source reduction policies require a reduction in the production and use of single-use plastics over time. They are distinct from virgin plastic reduction, which focuses on using less virgin resin. While both approaches to reduction can result in greenhouse gas emission reductions and improvements in the waste management system, only source reduction confers major pollution reduction benefits by reducing the number of single-use plastics on the market. California and Minnesota's EPR laws are examples of how source reduction can be incorporated in EPR programs to deliver stronger environmental benefits by requiring that producers reduce the amount of plastic packaging that they put on the market.

To learn more about how EPR, DRS and source reduction can work together, see Ocean Conservancy's toolkit for comprehensive EPR in the U.S., Tackling Plastic Pollution Through Producer Accountability.

Virgin Plastic Fees

The low cost of plastic as a material has been a major factor driving its increased use over the last several decades. Plastics are derived from fossil fuels, and their price is artificially low due to decades of subsidies for the fossil fuel industry. According to the International Monetary Fund, fossil fuel subsidies in the U.S. totaled $757 billion in 2022.[80] A fee on virgin resin is an effective tool to level the playing field between virgin plastic, recycled plastic and other alternatives like reuse systems or other materials like glass or paper. Like other polluter-pay policies, the fees collected could be used to remediate the impacts of plastic pollution or invest in the circular economy, such as through reuse or recycling systems. Proposals for a fee on virgin plastic are often narrowly targeted towards single-use plastics, excluding certain plastics, like those used in medical applications. For example, the U.K. has established a "Plastics Packaging Tax" of £217.85 per metric ton on single-use plastics that contain less than 30% recycled content.[81]

What Is Chemical Recycling?

Chemical recycling (also known as **advanced recycling** or **molecular recycling**) is an umbrella term for a suite of technologies that use nonmechanical processes to break down plastics. Chemical recycling technologies can be roughly broken down into **three main categories**:

1. **Conversion technologies**
   These technologies, like pyrolysis and gasification, use high heat and pressure with limited amounts of oxygen to turn plastics into pyrolysis oil or synthetic gas. These technologies release 30-200 times more greenhouse gas emissions than mechanical recycling.[82]

2. **Depolymerization technologies**
   These technologies, like solvolysis or methanolysis, use chemicals, enzymes, heat and/or pressure to break plastic polymers back into monomers (the building block for new plastics).

3. **Purification technologies**
   These technologies use chemicals and heat to dissolve and recollect the plastic without changing the basic molecular structure of the plastic polymer.

Chemical recycling technologies, especially pyrolysis and gasification, are being pushed as the solution to the plastic pollution crisis and the low and stagnant recycling rate for plastics. However, these conversion technologies do not recover plastics. Instead, they turn plastics back into fossil fuels like oil and synthetic gas to be used for energy. In practice, this means turning plastic waste into fuel and using more virgin plastic to make new products, which does not improve plastics recycling or help achieve a circular economy. Many of these technologies are expensive to build and operate, diverting funding that could be better spent improving our existing system. In addition, many of these technologies release harmful emissions like volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and other toxics into the surrounding air and water.[83]

For more, see Ocean Conservancy's Learn More About Chemical Recycling.

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VII. Marine Debris and Cleanup Efforts

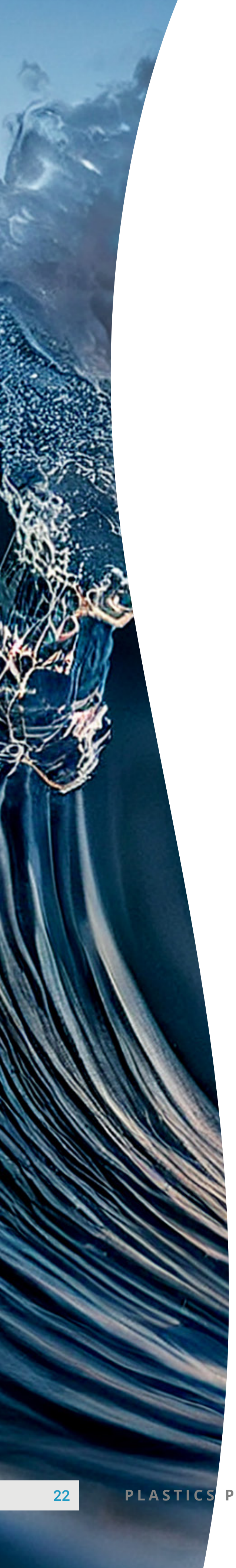
KEY TAKEAWAYS

Marine debris—which ranges from microplastics to large natural disaster debris—harms coastal communities, local economies and wildlife. While we need to prevent these items from becoming pollution in the first place, cleanups continue to be important to prevent further harm.

POLICY SOLUTIONS

- **NOAA Marine Debris Program.**
- **Save Our Seas Acts.**

Marine debris is the term used to describe a range of items found polluting the marine environment—including microplastics, single-use plastics, abandoned and lost fishing gear and derelict fishing vessels. While we need to prevent plastics and other marine debris from becoming pollution in the first place, cleanups will continue to play an important role in reducing the harm they cause once they enter the environment. Marine debris harms our coastal communities, local economies and marine life.[84] Cleanups not only remove plastic pollution from the environment, but they also remove other items from beaches and waterways, including debris from natural disasters.



NOAA Marine Debris Program

Initially created in 2006 and reauthorized on a bipartisan basis in 2020 through the Save Our Seas 2.0 Act, the NOAA Marine Debris Program seeks to prevent, research and clean up marine debris across the United States. Its six main pillars are: prevention, removal, research, monitoring and detection, response and coordination. Activities supported by the NOAA Marine Debris Program are broad, and examples include education and training for local residents to encourage businesses to reduce single-use plastics, funding Tribal organizations in Alaska to help them remove debris[85] and installing devices to capture litter and reduce flood risks in Florida.[86] Cleanups and pollution prevention programs like the NOAA Marine Debris Program continue to be essential to tackling this crisis and reducing the impacts of plastic pollution on communities.

Save Our Seas Acts

The Save Our Seas Act of 2018 and the Save Our Seas 2.0 Act of 2020 are two recent examples of bipartisan federal legislation to address marine debris, including through public-private partnerships. The Save Our Seas Acts have provided important support for NOAA's Marine Debris Program, supported international efforts to address marine debris and initiated important research to help address marine debris and plastic pollution. The Save Our Seas 2.0 Act also established two new public-private partnerships: the Marine Debris Foundation and the Genius Prize for Save Our Seas Innovations.

International Plastics Policies

Plastic pollution does not obey geographic boundaries. It is critical to work internationally to address this global crisis. As the top generator of plastic waste globally,[87] the U.S. has an especially important role to play in international efforts to address plastic pollution. In 2022, the U.N. Environment Assembly adopted resolution 5/14, "end plastic pollution: towards an international legally binding instrument," which started an ongoing negotiation process to create a global treaty to tackle the plastic pollution crisis across the full lifecycle of plastics. This treaty effort complements existing international agreements, such as the Basel Convention, which regulates the international movement and trade of hazardous wastes and plastic waste, and the International Convention for the Prevention of Pollution from Ships (also known as MARPOL), which aims to prevent pollution in the marine environment by maritime vessels.

Like other multilateral environmental agreements, these treaties are built on international consensus and rely on individual countries to pass the necessary rules and legislation to become a part of the agreement. Many businesses support these efforts to ensure a globally harmonized set of regulations to increase standardization and ease compliance. While the outcome of the global plastics treaty negotiations remains to be finalized, it is clear that no one country can tackle the plastic pollution crisis alone, and there is a clear need for strong domestic and international action and collaboration to protect our ocean for generations to come.

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VIII. Conclusion

With each new study on the impacts of plastic pollution, the urgency to prevent irreparable harm from plastic pollution becomes greater and greater. Science-based solutions to plastic pollution are already available, but there is no single solution. Systemic and coordinated change is needed to reduce the amount of plastic we make, better manage the materials we use and continue effective cleanups in the environment. Decades of voluntary initiatives have shown that they are not enough to meet this challenge and that policymakers need to step in to achieve the necessary change.

IX. Checklist for Effective Plastics Policy for the Ocean

Urgency: We need to act now to address plastic pollution. Policies should combine shorter-term actions that will deliver on environmental outcomes while longer-term changes are implemented.

Full Lifecycle of Plastics: While a single policy may not solve for every issue, policies should consider and reduce the harm associated with the production, use and disposal of plastics.

Source Reduction: We can't recycle our way out of the plastic pollution crisis. Policies should reduce the amount of plastics we make and use.

Reuse: Expanding and scaling up reuse and refill systems will support source reduction, reduce the environmental impacts of products we use and keep valuable materials out of landfills.

Reducing Virgin Plastic Production: Virgin plastic production is heavily subsidized, resulting in taxpayers footing the bill for both the production of plastics and their disposal. These subsidies also skew markets to perpetuate virgin plastic production and its environmental impacts rather than shifting to PCR or alternative materials.

Avoid Harmful Substitutions: Alternatives to single-use plastics shouldn't replace one single-use problem with another. Alternative materials should be evaluated for their environmental impacts and should be reusable, recyclable or compostable in the setting in which they will be used and disposed of. If reuse, recycling or composting services are not readily accessible, the item is more likely to end up in a landfill, incinerator or the environment.

Protecting Communities: Policies must prioritize the active participation of frontline communities to address harms already caused by plastic pollution and to prevent future harm.

BE WARY OF

Delaying action

While more research on plastics will help us better understand the impacts of plastic pollution on our environment and on human health and may present further opportunities for action, we know enough to act now. Supporting research should not be used to delay policy action.

Chemical recycling

Also known as advanced or molecular recycling, these technologies are often sold as a quick fix to the plastic waste crisis but in reality don't solve the real problems in the current system. Rather than invest hundreds of millions on harmful technologies, we should focus on upstream changes that will reduce the amount of plastics we produce and ensure recycling reduces demand for virgin plastic.

Preemption

Many state and local governments have enacted policies to address plastic pollution that are tailored to their circumstances and can have more ambition than policies that are more broadly applied, such as at the federal level. While uniformity among jurisdictions can provide greater certainty in some cases, preemption should be approached with caution and regional consideration to avoid undermining progress already being undertaken at a local level.

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X. Glossary and Frequently Used Plastics Terms

Bio-Based Plastics	Plastics made from plants or other renewable materials (e.g., agricultural waste, algae) instead of fossil fuels. Bio-based plastics are not necessarily compostable or biodegradable, and many behave in the environment like fossil fuel-based plastics.[88]
Compostable	Materials that are biodegradable (break down completely into natural components) under specific conditions (e.g., a compost pile). Many compostable materials require industrial composting conditions (higher heat, mixing) to break down.[89]
Chemical Recycling	Also known as advanced recycling or molecular recycling, chemical recycling is an umbrella term that includes a suite of technologies that use nonmechanical processes to break down plastics. Conversion technologies like pyrolysis or gasification are the most commonly used chemical recycling technologies. They turn plastics into oil or synthetic gas and release significant greenhouse gas emissions and harmful chemicals into the environment. For more details, see page 20.
Circular Economy	A system in which plastics and other materials are re-circulated to reduce waste, pollution and harmful emissions. For more, see the Save Our Seas 2.0 Act of 2020.[90]
Deposit Return System (DRS)	A deposit return system, also known as a recycling refund or bottle bill, is a type of EPR policy that provides a financial incentive through a deposit paid at the point of purchase for consumers to return a beverage container for recycling or reuse.
Extended Producer Responsibility (EPR)	Extended producer responsibility programs shift the costs of local recycling programs (collection, sorting and processing materials) and other end of life services like reuse and composting from ratepayers and local governments to the producers of packaging and paper products while also creating performance standards for producers to achieve better environmental and social outcomes.
Macroplastic	Plastics larger than 5 millimeters in size.
Marine Debris	As defined in the Marine Debris Act, marine debris "means 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."[91]

Material Recovery Facility (MRF)	A facility that receives, separates and sells or otherwise distributes postconsumer materials for recycling to responsible end markets.
Mechanical Recycling	The processing of materials into secondary raw materials for use in new products without changing the chemical structure of the material, usually through a process of sorting, grinding, washing and re-pelletizing.
Microplastic	Plastics between 100 nanometers and 5 millimeters in size.
Microfiber	Small, thread-like materials less than 5 millimeters in length. Microfibers derived from synthetic or semisynthetic materials are considered a kind of microplastic.
Nanoplastic	Plastics smaller than 100 nanometers.
Plastic	Plastics are a range of synthetic or semisynthetic materials made out of polymers that can be shaped into various rigid and flexible forms and includes coatings and adhesives. "Plastic" does not include natural rubber or naturally occurring polymers such as proteins or starches. "Plastic" includes and is not limited to: polyethylene terephthalate (PET); high-density polyethylene (HDPE); polyvinyl chloride (PVC); low-density polyethylene (LDPE); polypropylene (PP); polycarbonate (PC); polystyrene (PS); polylactic acid (PLA); and aliphatic biopolyesters, such as polyhydroxyalkanoate (PHA) and polyhydroxybutyrate (PHB).
Postconsumer Recycled Content (PCR)	Plastic resin material that is made from plastic waste that was collected and recycled. PCR is limited to materials that were collected and recycled from residential or commercial recycling programs and excludes any recycled content from the manufacturing of products (e.g., industrial scraps). This distinction is important to help make sure that plastics we use and dispose of as consumers are getting collected, recycled and used in new products.
Resin Identification Code (RIC)	A number (1-7) that identifies the type of plastic used in a product, which can be used by recyclers to help properly sort and process materials.
Responsible End Market (REM)	A REM is a market for materials that recycles and recovers materials in a way that is safe for the environment, public health and workers.
Reuse	The repeated use of a durable item designed to be recirculated multiple times for the same or similar purpose, like porcelain plates and stainless-steel cups that are washed and returned for use by consumers.
Refillable	Materials designed to be filled and used multiple times by consumers for the same or similar purpose in their original format, like water bottles or soap dispensers, and that are typically sold to consumers once for the duration of their usable life.
Single-Use	Conventionally disposed of after one use, including through recycling or composting, or not sufficiently durable or washable to be, or not intended to be, reusable or refillable.
Source Reduction	Source reduction for single-use plastics means reducing the total amount of single-use plastics made and used, relative to an established baseline. Methods of source reduction include shifting to reusable or refillable materials, eliminating unnecessary materials, right-sizing packaging, concentrating products to limit packaging, or using bulk packaging to decrease the overall amount of packaging. Source reduction for single-use plastics does not include replacing a recyclable or compostable material with a material that is less likely to be recycled or composted or switching from virgin covered material to postconsumer recycled content.

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