BEYOND PLASTICS

Quick Facts At Your Fingertips

November 2025

Welcome to the Pocket Guide to Plastics, a living document of plastic pollution facts curated by Beyond Plastics, whose mission is to end plastic pollution everywhere. Learn more at BeyondPlastics.org

Contents

Basic Facts About Plastics

Plastic growth compared to the past:	***Source***
Production: Global plastic production grew from 4 billion pounds in 1950 to 961 billion pounds in 2022 — a more than 200x increase!	*Policy Insights: Mobilising Trade to Curb Plastic Pollution*. UN Trade & Development (UNCTAD), Aug. 2025, Global Trade Update. Page 3. [Link]
Waste: Global plastic waste more than doubled from 2000 to 2019.	*Economic Drivers, Environmental Impacts and Policy Options*. OECD, 22 Feb. 2022, Global Plastics Outlook. Page 14. [Link]
Waste: Plastic waste in the U.S. increased from 60 pounds per person per year in 1980 (total: 13.6 billion pounds) to 218 pounds per person in 2018 (total: 71.4 billion pounds) — a 263% total increase (roughly 15% per year).	U.S. EPA, *National Overview: Facts and Figures on Materials, Wastes and Recycling*, Sept 11, 2025, Accessed Sept 2025, [Link]
Plastic production and waste projected to the future:	
Production and use: Global annual plastic production and use will increase by 170% from 2020 to 2040 (from 959 to 1622 trillion pounds)	*Policy Scenarios for Eliminating Plastic Pollution by 2040*. OECD, 2 Oct. 2024, OECD Policy Highlights. [Link]
Waste: Global plastic waste will increase by 170% from 2020 to 2040 (from 794 to 1360 trillion pounds)	*Policy Scenarios for Eliminating Plastic Pollution by 2040*. OECD, 2 Oct. 2024, OECD Policy Highlights. [Link]
Pollution: Plastic pollution in the environment will increase 150%, from 44 trillion pounds in 2020 to 66 trillion pounds in 2040.	*Policy Scenarios for Eliminating Plastic Pollution by 2040*. OECD, 2 Oct. 2024, OECD Policy Highlights. [Link]

Plastic pollution in rivers and oceans will almost double from 335 trillion pounds in 2020 to 661 trillion pounds by 2040

Climate:

In 2019, global production of plastics represented 5.3% of total global greenhouse gas emissions. This is almost four times the emissions of the global aviation sector.

Karali, Nihan, et al. *Climate Impact of Primary Plastic Production*. Lawrence Berkeley National Laboratory, 12 Apr. 2024, [Link]

Greenhouse gas emissions from plastic production could double, or even triple, globally by 2050 (from 2019 levels).

Karali, Nihan, et al. *Climate Impact of Primary Plastic Production*. Lawrence Berkeley National Laboratory, 12 Apr. 2024, [Link]

Plastic use by application (2019):

Almost 40% of global plastic produced in 2015 was used for packaging.

All applications (2015):
35.9% packaging, 6.6% transportation, 16% building and construction, 4.4% electrical/electronic, 10.3% consumer and institutional products, 0.7% industrial machinery, 14.5% textiles, 11.5% other.

Geyer, Roland, et al. “Production, Use, and Fate of All Plastics Ever Made.” *Science Advances*, July 2017, [Link]

Costs

Plastic production, use and disposal each year costs the U.S. up to $1.1 trillion (estimated between $436 billion and $1.109 trillion) in social costs, most of which are due to human health impacts. This amount is still likely an underestimate due to data gaps.

Lauer, Nancy, et al. *The Social Cost of Plastic to the United States*. Nicholas Institute for Energy, Environment & Sustainability, 2025, [Link]

Alternatives to Plastics

Fortunately, there are many safer alternatives to various plastics that are readily available for people looking to avoid as much plastic as possible.

Building Products

Product/Category	**Plastic-Free Alternatives**
Pipes	Copper (preferably recycled), iron, concrete, steel
Siding	Wood (e.g., clapboard, shingles), brick, stone, stucco, aluminum
Paint	Clay-based paints, linseed oil, lime paints, milk paints, chalk paints
Insulation	Mineral wool, cellulose, hemp, wood fiber, fiberglass
Flooring	Wood, ceramic tile, brick, stone, cork, bamboo
Countertops	Wood, natural stone, concrete, stainless steel, ceramic tile
Windows and doors	Wood, aluminum, steel
Decking	Wood
Roofing	Metal, wood, ceramic tile

Packaging

Product/Category	**Plastic-Free Alternatives**
Bottles	Glass, aluminum - preferably refillable
Wrappers	Paper, waxed paper, foil
Boxes/containers	Cardboard, paper, metal
Takeout containers	Paper, metal (bring a tiffin or reusable container for to-go foods)
Cling wrap/films	Waxed paper, foil, fabric impregnated with beeswax

Kitchen

Product/Category	**Plastic-Free Alternative**
Plastic cooking utensils	Metal or wooden utensils
Non-stick cookware, baking sheets, and trays	Copper, stainless steel, cast iron, glass pots and pans, uncoated metal baking sheets

Plastic cutting boards	Wood, bamboo, stainless steel, titanium, glass, stone
Kitchen sponges with plastic scrubber side	Cellulose sponges without a scrubber end; tough-to-remove food can be removed with a bamboo, wooden, or metal scraper after soaking
Plastic bottle brushes and scrub brushes	Wood and natural fiber brushes
Tupperware/other plastic food-storage and freezer containers	Glass mason-style jars or other reused glass or stainless steel containers. Start a secondhand glass jar collection — reuse is even better than recycling.
Plastic produce bags	Cotton produce bags, paper bags; store herbs in a glass jar, or simply go without a bag
Plastic shopping bags	Heavy-duty reusable cotton or hemp totes
Counter, ceramic, and glass cleaner in plastic bottles	Powdered cleaners sold in paper cylindrical containers, concentrated liquid cleaner tablets you hydrate at home in a glass bottle (major companies now sell a full line of counter, glass, and all-purpose cleaners)
Plastic dust pan and broom with plastic handle and synthetic bristles	Wooden handled broom with natural bristles and metal dustpan

Bathroom

Product/Category	**Plastic-Free Alternatives**
Shampoo, conditioner, body wash, or soap in plastic bottles	Shampoo and conditioner bars, bar soap, plastic-free hand soap to which you add water at home in a glass bottle
Moisturizer, creams in plastic bottles	Products sold in glass, metal, or ceramic bottles
Toothpaste in plastic tubes	Tooth powder sold in a metal tin or glass jar, toothpaste tablets sold in glass or paper. Note that aluminum toothpaste tubes typically contain plastic liners, so you'll want to avoid those if you're looking for 100% plastic-free.
Toothbrush with plastic handle and plastic (typically nylon) bristles	Bamboo-handled toothbrush with natural fiber bristles
Mascara, lipstick, chapstick, etc., sold in plastic containers/tubes	Makeup sold in paper containers or refillable metal or ceramic holders
Vinyl shower curtain	Fabric (non-synthetic) shower curtain or glass shower

	doors

Laundry Room

Product/Category	**Plastic-Free Alternatives**
Plastic laundry basket	Woven natural fiber laundry basket or heavy-duty cotton canvas laundry tote/basket with handles
Laundry detergent in plastic bottle; oxygen bleach in plastic tub; laundry detergent in little plastic pods made with PVA (polyvinyl alcohol), a type of plastic that ends up in the waste water	Powdered laundry soap in a cardboard box that you either order or refill from a local refill shop. Some companies have a great line of powdered laundry detergent and oxygen bleach shipped in paper bags.
Bleach in plastic bottle	White vinegar (in a glass bottle)
Fabric softener in plastic bottle or in dryer sheet form	Wool dryer balls for softening clothes in the dryer. (Fabric softeners may contain a range of toxic chemicals and fragrances, and softener sheets are also made with polyvinyl alcohol, or PVA.)
Synthetic plastics used in clothing fabric, particularly polyester	Natural fibers like cotton, hemp, linen and wool

The United States is the World's Largest Generator of Plastic Waste

	Source
The United States is home to roughly 4% of the world's population and:	[US Census]
• Uses about 16% of the world's energy	U.S. Energy Information Administration, *FAQ: "What is the United States' share of world energy consumption?"*, April 2024 [Link]
• Creates about 12% of the world's solid waste	Nichols, Will, and Niall Smith. *Waste Generation and Recycling Indices 2019 Overview and Findings*. Verisk Maplecroft, June 2019, Page 5. [Link]
• Creates about 17% of the world's plastic waste	Law, Kara Lavender, et al. "The United States' Contribution of Plastic Waste to Land and Ocean." *Science Advances*, Oct. 2020, [Link]
The U.S. generates the largest amount of plastic waste in the world. In 2016, alone, the U.S. generated over 92 billion pounds of plastic waste. (That's 286 pounds per person each year!)	Law, Kara Lavender, et al. "The United States' Contribution of Plastic Waste to Land and Ocean." *Science Advances*, 2020, [Link]
The U.S. is the world's largest oil producer, accounting for a fifth of global production in 2024.	*Statistical Review of World Energy 2025*. 74th Edition, Energy Institute, 2025, Page 4, [Link]
The U.S. is the top exporter of liquified natural gas (LNG). LNG is a methane-based fossil fuel, and although it has been marketed as cleaner, methane leaks throughout the supply chain, contributing significantly to climate change.	U.S. Energy Information Administration, *The United States remained the world's largest liquefied natural gas exporter in 2024*, In-Brief Analysis, 2025 [Link]

Plastics and Environmental Justice

Definition:	***Source***
Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.	U.S. EPA, *"Learn About Environmental Justice",* Archived January 2021, [Link]
Living near environmental hazards contributes to poorer health and disproportionate health outcomes; and there are significant disparities by race and income in relation to proximity to environmental hazards.	Brender, Jean D., et al. "Residential Proximity to Environmental Hazards and Adverse Health Outcomes." American *Journal of Public Health*, Dec. 2011, [Link]
Incinerators:	
A 2019 study found that 79% of incinerators are located in low-income communities and communities of color. The pollutant fumes produced by incinerating plastic have toxic effects when inhaled.	Baptista, Ana Isabel, and Adrienne Perovich. *U.S. Municipal Solid Waste Incinerators: An Industry in Decline*. The New School, May 2019 [Link]
Most "chemical recycling" facilities in the U.S. are located in low-income communities and communities of color.	Sharp, Renee, et al. *More Recycling Lies: What the Plastics Industry Isn't Telling You About "Chemical Recycling."* Natural Resources Defense Council (NRDC), Mar. 2025, [Link]
Gulf Coast and Ohio River Valley:	
Environmental injustices are particularly rampant along the Gulf Coast in Texas and Louisiana where the petrochemical industry's facilities are concentrated due to the area's abundant oil and gas deposits, easy access to shipping lanes, and comparatively lax enforcement of environmental regulations.	*"Petrochemicals and Plastic,"* FracTracker Alliance, 22 Aug. 2025, [Link]
Roughly 200 plants and refineries exist along an 85-mile stretch of the Mississippi River in Louisiana that became known as "Cancer Alley" after studies	*"The Shocking Hazards of Louisiana's Cancer Alley."* Johns Hopkins Bloomberg School of Public Health, 4

found unusually high rates of cancer among residents in these communities.	Aug. 2025, [Link] Terrell, Kimberly A., and Gianna St. Julien. “Discriminatory Outcomes of Industrial Air Permitting in Louisiana, United States.” *Environmental Challenges*, vol. 10, Jan. 2023, [Link]
In 2014, the U.S. EPA estimated the risk of cancer in “Cancer Alley” was 95% higher than most Americans, but it may be even higher. According to a study by Johns Hopkins University, the estimated cancer risk caused by pollution was 11 times higher than the U.S. EPA’s own estimates, and more than five times higher than the U.S. EPA’s “acceptable limit”.	Robinson, Ellis S., et al. “Total Cancer Risk Estimates from Measured Concentrations of Volatile Organic Compounds in Industrialized Southeastern Louisiana.” *Proceedings of the National Academy of Sciences*, Oct. 2025, [Link].
Industrial emissions are seven to 21 times higher among communities of color in Louisiana.	Terrell, Kimberly A., and Gianna St. Julien. “Discriminatory Outcomes of Industrial Air Permitting in Louisiana, United States.” *Environmental Challenges*, vol. 10, Jan. 2023, [Link]
The Ohio River Valley in Appalachia is the newest frontier in the petrochemical industry’s plans for growth and represents yet another “sacrifice zone.”	*“Petrochemicals and Plastic”,* FracTracker Alliance, 22 Aug. 2025, [Link]

Plastics and Climate Change

	Source
Plastic is made from fossil fuels and chemicals, and releases greenhouse gases at every stage.	Karali, Nihan, et al. *Climate Impact of Primary Plastic Production*. Lawrence Berkeley National Laboratory, 12 Apr. 2024, [Link]
In 2019, plastic production released roughly 4.9 trillion pounds (2.24 billion metric tons) of carbon dioxide equivalent into the atmosphere, or 5.3% of total global greenhouse gas (GHG) emissions.	Karali, Nihan, et al. *Climate Impact of Primary Plastic Production*. Lawrence Berkeley National Laboratory, 12 Apr. 2024, [Link]
If the plastics industry were a country, it would be the world's fourth-largest greenhouse gas emitter, beaten out only by China, the U.S., and India (using 2019 data).	Karali, Nihan, et al. *Climate Impact of Primary Plastic Production*. Lawrence Berkeley National Laboratory, 12 Apr. 2024, [Link] "Historical GHG Emissions", Climate Watch Data, Accessed September 2024, [Link]
As of 2024, the plastics industry released nearly four times as many greenhouse gas emissions as the global aviation industry.	Karali, Nihan, et al. *Climate Impact of Primary Plastic Production*. Lawrence Berkeley National Laboratory, 12 Apr. 2024, P. 55 [Link]
The U.S. plastics industry emits as much greenhouse gas as 116 coal-fired power plants and is projected to overtake the emissions of the coal industry by 2030.	The New Coal: Plastics & Climate Change. Beyond Plastics, Oct. 2021, [Link]
In the U.S., plastic feedstocks have increasingly shifted from crude-oil derived liquids to ethane, much of which is a byproduct of hydrofracking.	*Fueling Plastics: Fossils, Plastics, & Petrochemical Feedstocks*. 2017. Center for International Environmental Law, [Link]
The gas fracking boom has driven the steep increase in plastic production. Fracking emits greenhouse gases, and fracking fluids and wastewater have contaminated groundwater.	Gardiner, Beth. "The Plastics Pipeline: A Surge of New Production Is on the Way." *Yale Environment 360*, Yale School of the Environment, 19 Dec. 2019, [Link] *Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States*, U.S. EPA, Dec. 2016, [Link]

Chemicals Used in Plastics

	Source
Researchers have identified over 16,000 chemicals in plastics. Many are used as processing aids, or as additives to give the plastic certain properties such as malleability, strength, heat resistance, color, water resistance, fire resistance, texture, etc.	Monclús, L., et al. "Mapping the Chemical Complexity of Plastics." *Nature*, vol. 643, no. 8071, July 2025, [Link]
More than a quarter of the chemicals found in plastics (26%, or 4,219) are known to be hazardous to humans or the environment, including PFAS; bisphenols like BPA and BPS; vinyl chloride; heavy metals like lead and cadmium; brominated flame retardants; phthalates; and more.	Wagner, Martin, et al. *State of the Science on Plastic Chemicals - Identifying and Addressing Chemicals and Polymers of Concern*. PlastChem, 2024, P. 40 [Link]
Plastic chemicals can be carcinogenic, mutagenic, persistent, and/or bioaccumulative. They are linked to health impacts including reproductive, neurodevelopmental, immune, and metabolic disorders.	Monclús, L., et al. "Mapping the Chemical Complexity of Plastics." *Nature*, vol. 643, no. 8071, July 2025, [Link]
The majority of the chemicals found in plastics (66% or 10,726) have never been tested for safety.	Monclús, L., et al. "Mapping the Chemical Complexity of Plastics." *Nature*, vol. 643, no. 8071, July 2025, [Link]
Toxic additives make much post-consumer plastic problematic for use in food or beverage packaging.	*Assessing the State of Food Grade Recycled Resin in Canada & the United States*. Environment and Climate Change Canada and Stina Inc., 2021. Food Grade Recycled Resin. [Link]
Almost $250 billion in U.S. healthcare costs in 2018 were attributable to four classes of chemicals commonly used in plastics: phthalates, bisphenols, the family of PFAS chemicals, and polybrominated diphenyl ethers (PBDEs).	Trasande, Leonardo, et al. "Chemicals Used in Plastic Materials: An Estimate of the Attributable Disease Burden and Costs in the United States." *Journal of the Endocrine Society*, vol. 8, no. 2, Feb. 2024, [Link]

Common Chemicals Found in Plastics:

Chemical Group	What It Is	Examples of Where It's Found	Health Impacts	Information Source
PFAS ("forever chemicals")	Fluorinated chemicals that make items stain-resistant, water-proof, or non-stick	Non-stick pans, food packaging, firefighting foam, raingear	Build up in the body and environment; linked to cancer, immune problems, reproductive harms, and hormone disruption	Clean Production Action
Bisphenols (like BPA and BPS)	Chemicals used to make hard, clear plastics and resins	Can linings, polycarbonate items (e.g., glasses, CDs) thermal receipts, dental materials	Can mimic and interfere with the hormone system (i.e., endocrine disrupter), leading to reproductive and development issues, cancers, diabetes, obesity, and more	Plastic Pollution Coalition
Phthalates	Chemicals used to make plastic (primarily PVC) soft and flexible	Plastic packaging, vinyl flooring, personal care products	Can mimic and interfere with the hormone system (i.e., endocrine disrupter), leading to reproductive and development issues, cancers, diabetes, obesity, and more	Toxic-Free Future
Lead	A toxic metal sometimes added to make plastic more flexible or colorful	PVC plastics, inks on plastic and packaging, recycled plastic materials	Highly toxic to brain development, especially in children; linked to learning and behavioral problems, high blood pressure, and kidney damage	Dignity Health
Cadmium	A toxic metal used in some plastic and color pigments	PVC plastics and pigmented items, especially imported from other countries	Can build up in the body; linked to kidney damage, bone problems, and cancer	Rise St. James

Vinyl Chloride

	Source
Vinyl chloride is a petrochemical that's used almost exclusively to make polyvinyl chloride (PVC) plastic and vinyl.	National Capital Poison Center, "What is vinyl chloride," Accessed August 2025, [Link]
About 99% of global vinyl chloride is used to make PVC and its related copolymers	Dreher, Eberhard-Ludwig, et al. "Chloroethanes and Chloroethylenes." Ullmann's Encyclopedia of Industrial Chemistry, pp. 40. [Link]
Some new water and sewage installations use PVC pipes. As many as 50 toxic chemicals, including "residual" or unpolymerized vinyl chloride, may be released into drinking water by PVC pipes.	The Perils of PVC Plastic Pipes. Beyond Plastics, Apr. 2023, [Link]
There is no safe level of exposure to vinyl chloride.	California Air Resources Board, *Vinyl Chloride & Health*, August 2025, [Link]
The International Agency for Research on Cancer (IARC) classifies vinyl chloride as a Group 1 carcinogen, meaning it's known to be carcinogenic to humans — this is the highest level of certainty in the IARC classification system.	IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, "VINYL CHLORIDE," *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans,* No. 100F, Lyon (FR): 2012, [Link]
Vinyl chloride is associated with an increased risk of a rare form of liver cancer (hepatic angiosarcoma), as well as primary liver cancer (hepatocellular carcinoma), brain and lung cancers, lymphoma, and leukemia.	National Cancer Institute, "Vinyl Chloride," June 13, 2024, Accessed August 2025, [Link]
Short-term exposure to vinyl chloride can cause neurological effects such as dizziness, drowsiness, confusion, and even death.	*Toxicological Profile for Vinyl Chloride*. Agency for Toxic Substances and Disease Registry (US), 2024. Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles. [Link]

The production of PVC plastic releases hundreds of thousands of pounds of carcinogenic vinyl chloride into the air every year in the U.S.	*PVC Poison Plastic*. Toxic-Free Future, 13 Apr. 2023, [Link]
As of 2023, nineteen vinyl chloride and PVC resin factories operate in the United States. They are primarily concentrated in environmental justice communities in Texas, Kentucky, Louisiana, New Jersey, Illinois, and Mississippi, where they threaten the health of both workers and residents.	*PVC Poison Plastic*. Toxic-Free Future, 13 Apr. 2023, [Link]
When burned, vinyl chloride produces additional toxic chemicals, such as hydrochloric acid and lethal phosgene — a notorious chemical weapon during World War I. Acute exposure to these chemicals may cause immediate harm to local ecosystems, including the deaths of wild and farmed animals and pets.	Li, Chengjun, et al. "Vinyl Chloride Accident Unleashes a Toxic Legacy." *Environmental Science and Ecotechnology*, vol. 14, Mar. 2023, [Link]
Vinyl chloride can also dissolve in water and attach to soil particles. It remains stable in the absence of oxygen and sunlight; therefore it can contaminate groundwater and lead to long-term harm to wildlife, including cancer and neurological disorders.	Li, Chengjun, et al. "Vinyl Chloride Accident Unleashes a Toxic Legacy." *Environmental Science and Ecotechnology*, vol. 14, Mar. 2023, [Link]
People can also be exposed to vinyl chloride near landfills, PVC manufacturing facilities, and hazardous waste sites, as well as through cigarette and cigar smoke, and potentially through drinking water.	Agency for Toxic Substances and Disease Registry, *Vinyl Chloride*, ToxFAQs, Centers for Disease Control and Prevention (CDC), January 2024, [Link]
More than three million Americans live within one mile of the railroad tracks on which vinyl chloride is transported. Thirty-six million pounds of this toxic chemical may be traveling along rail lines at any given time in the United States.	*Toxic Cargo: How Rail Transport of Vinyl Chloride Puts Millions at Risk, an Analysis One Year after the Ohio Train Derailment*. Toxic-Free Future and Material Research L3C, 22 Jan. 2024, [Link]

Plastics and Human Health

General:	***Source***
Plastic harms human health at every stage of the life cycle, from production to use to disposal.	Landrigan, Philip J., et al. "The Lancet Countdown on Health and Plastics." *The Lancet*, Aug. 2025, [Link]
Americans spent over $1.5 trillion on health costs related to the impacts of plastics in 2015.	Landrigan, Philip J., et al. "The Minderoo-Monaco Commission on Plastics and Human Health." *Annals of Global Health*, vol. 89, no. 1, 2023, [Link]
Production:	
Globally, approximately 32,000 premature deaths occurred among plastic production workers in 2015, resulting in annual health-related economic costs of $40 million.	Landrigan, Philip J., et al. "The Minderoo-Monaco Commission on Plastics and Human Health." *Annals of Global Health*, vol. 89, no. 1, 2023, [Link]
Fenceline communities are exposed to toxic pollution from plastic production, including PM2.5 (particulate matter), carcinogens, and more. In 2015, PM2.5 emissions were responsible for an estimated 158,000 premature deaths globally and for health-related economic losses of more than $200 billion.	Landrigan, Philip J., et al. "The Minderoo-Monaco Commission on Plastics and Human Health." *Annals of Global Health*, vol. 89, no. 1, 2023, [Link]
Product use:	
Plastics always require the addition of toxic additives — chemicals that impart properties like color, flexibility, and durability. About 25% of the 16,000-plus chemicals found in plastic are known to be toxic to human health or the environment.	Wagner, Martin, et al. *State of the Science on Plastic Chemicals - Identifying and Addressing Chemicals and Polymers of Concern*. PlastChem, 2024, [Link]
Plastic packaging of food and beverages is a major source of exposure, as chemicals and microplastics can leach into the food and drink.	Geueke, Birgit, et al. "Evidence for Widespread Human Exposure to Food Contact Chemicals." *Journal of Exposure Science & Environmental Epidemiology*, vol. 35, no. 3, May 2025, [Link]
Dietary uptake of microplastics increased more than sixfold between 1990 and 2018.	Zhao, Xiang, and Fengqi You. "Microplastic Human Dietary Uptake from 1990 to 2018

Grew across 109 Major Developing and Industrialized Countries but Can Be Halved by Plastic Debris Removal." *Environmental Science & Technology*, May 2024, [Link]

Waste:

Microplastics are small shards of plastic smaller than 5 mm that are generated as plastics break up in the environment. These tiny plastic shards can then enter the body through the food we eat and the air we breathe.

Microplastics have been found in:

• Human blood	Leonard et al., *Environment International*, 2024, [Link]
• Breast milk	Ragusa et al., *Polymers*, 2022, [Link]
• Liver	Horvatits et al., *eBioMedicine*, 2022, [Link]
• Kidney	Massardo et al., *Environment International*, 2024, [Link]
• Colon	Cetin et al., *Environmental Chemistry Letters*, 2023, [Link]
• Placenta	Ragusa et al., *Environment International*, 2021, [Link]
• Lungs	Jenner et al., *Science of The Total Environment*, 2022, [Link]
• Testicles	Zhao et al., *Science of The Total Environment*, 2023, [Link]
• Spleen	Horvatits et al., *eBioMedicine*, 2022, [Link]
• Brain	Nihart et al., *Nature Medicine*, 2025, [Link]
• Heart	Yang et al., *Environmental Science & Technology*, 2023, [Link]
• Heart arteries	Marfella et al., *New England Journal of Medicine*, 2024, [Link]

• Feces	Yan et al., *Environmental Science & Technology*, 2022, [Link]
The physical presence of microplastics can cause damage to tissues and inflammation, and they can also act as carriers for various toxic chemicals.	Thompson, Richard C., et al. “Twenty Years of Microplastic Pollution Research—What Have We Learned?” *Science*, Oct. 2024, [Link]
Plastic disposal methods like incineration, chemical recycling, and landfills can release toxic chemicals that pollute our air and food systems.	Landrigan, Philip J., et al. “The Lancet Countdown on Health and Plastics.” *The Lancet*, Aug. 2025, [Link]

Microplastic and Nanoplastic Pollution

What are they?	***Source***
Microplastics are 5 millimeters — the length of a grain of rice — or less. Nanoplastics are less than 1 micrometer and in the *nano*meter range — nanoplastics can be as small as a virus.	U.S. EPA, *Microplastic Research*, July 2 2025, Accessed September 2025, [Link]
Microplastics come from a variety of sources. Common sources include fragments of bigger plastics that have broken up, paint that chips or flakes, plastic films like plastic bags, nurdles, and particles from tires.	Ocean Conservancy, *Microplastics Facts and Figures*, February 2023, [Link]
Nurdles are small (about 3 to 5 millimeters), lightweight plastic pellets that are the starting materials for plastic products, also known as pre-production plastics. Easily spilled during production and transport, they are nearly impossible to clean up and a major source of microplastic pollution. In a single shipwreck accident in Sri Lanka in June 2021, 70 to 75 billion nurdles spilled into the water, making it the largest known marine plastic spill.	Rubesinghe, Chalani, et al. *X-Press Pearl, a 'New Kind of Oil Spill' Consisting of a Toxic Mix of Plastics and Invisible Chemicals*. International Pollutants Elimination Network (IPEN), Feb. 2022, [Link]
Prevalence:	
Microplastics are found virtually everywhere on Earth, from the deepest parts of the ocean like the Mariana Trench (Geochemical Perspectives 2018) to the Arctic (Nature Reviews Earth & Environment, 2022) to remote regions like Mount Everest (One Earth, 2020).	**Mariana trench:** Peng, X., et al. "Microplastics Contaminate the Deepest Part of the World's Ocean." *Geochemical Perspectives Letters*, Nov. 2018, [Link] **Arctic:** Bergmann, Melanie, et al. "Plastic Pollution in the Arctic." *Nature Reviews Earth & Environment*, 2022, [Link] **Mount Everest:** Napper, Imogen E., et al. "Reaching New

	Heights in Plastic Pollution—Preliminary Findings of Microplastics on Mount Everest." *One Earth*, Nov. 2020, [Link]
On average, a liter of water in plastic bottles contained about 240,000 detectable plastic fragments — up to 100 times greater than previous estimates, thanks to increasingly advanced microplastic/nanoplastic detection techniques.	Qian, Naixin, et al. "Rapid Single-Particle Chemical Imaging of Nanoplastics by SRS Microscopy." *Proceedings of the National Academy of Sciences*, Jan. 2024, [Link]
The amount of microplastics in the environment doubled every 15 years from 1945 to 2009.	Brandon, Jennifer A., et al. "Multidecadal Increase in Plastic Particles in Coastal Ocean Sediments." *Science Advances*, Sept. 2019, [Link]
Chemical toxicity:	
Plastic additives in microplastics can leach into the environment. These chemicals can cause additional damage to human health, animals, and plants, independent of the plastic particles.	Hermabessiere, Ludovic, et al. "Occurrence and Effects of Plastic Additives on Marine Environments and Organisms: A Review." *Chemosphere*, Sept. 2017, [Link]
Marine impact:	
About 60% of fish were found to contain microplastics in their organs.	Sequeira, Inês F., et al. "Worldwide Contamination of Fish with Microplastics: A Brief Global Overview." *Marine Pollution Bulletin*, Nov. 2020, [Link]
Blue whales may consume up to 10,000 microplastics each day.	Kahane-Rapport, S. R., et al. "Field Measurements Reveal Exposure Risk to Microplastic Ingestion by Filter-Feeding Megafauna." *Nature Communications*, Nov. 2022, [Link]
Agricultural impact:	
Microplastics can slow photosynthesis, which is estimated to cause between 4% and 14% of all crop loss across the world.	Zhu, Ruijie, et al. "A Global Estimate of Multiecosystem Photosynthesis Losses under Microplastic Pollution." *Proceedings of the National Academy of Sciences*, Mar. 2025, [Link]

Microplastics damage the physical and chemical properties of soil, which can increase agricultural greenhouse gas emissions and reduce soil quality.	Zhang, Linjie, et al. "Microplastics and Soil Greenhouse Gas Emissions: A Critical Reflection on Meta-Analyses." *Environmental Science & Technology*, Aug. 2025, [Link] De Souza Machado, Anderson Abel, et al. "Impacts of Microplastics on the Soil Biophysical Environment." *Environmental Science & Technology*, Sept. 2018, [Link]
Nanoplastics are able to enter and accumulate in plant tissue, including the vegetables we eat.	Clark, Nathaniel J., et al. "Determining the Accumulation Potential of Nanoplastics in Crops: An Investigation of 14C-Labelled Polystyrene Nanoplastic into Radishes." *Environmental Research*, Aug. 2025, [Link]

Plastics and the Ocean

General:	***Source***
The ocean is the ultimate sink for plastic, meaning plastic can enter the ocean from many sources, including rivers and streams, stormwater, wastewater, rain, beach litter, and directly from boats.	*Reckoning with the U.S. Role in Global Ocean Plastic Waste*., National Academies of Sciences, Engineering, and Medicine, 29 Mar. 2022, [Link]
The United States is one of the biggest contributors to ocean plastics, ranking between numbers 3 and 12, depending on the method of calculation.	Law, Kara Lavender, et al. "The United States' Contribution of Plastic Waste to Land and Ocean." *Science Advances*, Oct. 2020, [Link]
The most common items collected from beaches around the globe are plastic (PET) bottles, plastic food wrappers, plastic bottle caps, beverage cup lids, plastic straws, plastic carryout bags, plastic (EPS) cups and clamshells, plastic cutlery, plastic cups, and cigarettes	*Top Ten Plastic Items Found on US Beaches: Estimating US Consumption of Beach Litter Items*. Ocean Conservancy, Aug. 2022, [Link]
How much plastic?	
Around 33 billion pounds of plastic enter the ocean every year. This is the equivalent of dumping two full garbage trucks full of plastic in the ocean every minute.	Lau, Winnie W. Y., et al. "Evaluating Scenarios toward Zero Plastic Pollution." *Science*, Sept. 2020, [Link] Borrelle, Stephanie B., et al. "Predicted Growth in Plastic Waste Exceeds Efforts to Mitigate Plastic Pollution." *Science*, Sept. 2020, [Link]
Plastics account for more than 85% of the total pollution in oceans.	McGlade, Jacqueline. *From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution*. United Nations Environment Program (UNEP), 2021, [Link]
The estimated amount of U.S. plastic waste entering the oceans increased by five times between 2010 and 2016.	Law, Kara Lavender, et al. "The United States' Contribution of Plastic Waste to Land and Ocean." *Science Advances*, Oct. 2020, [Link]
Without action, the amount of plastic dumped in the	Lau, Winnie W. Y., et al. "Evaluating

ocean will triple by 2040 (relative to 2016 levels).	Scenarios toward Zero Plastic Pollution." *Science*, Sept. 2020, [Link] Borrelle, Stephanie B., et al. "Predicted Growth in Plastic Waste Exceeds Efforts to Mitigate Plastic Pollution." *Science*, Sept. 2020, [Link]
Microplastics:	
Using data from 2007 to 2013, more than 5 trillion plastic pieces weighing over 250,000 tons — about the weight of 1,250 blue whales! — are floating in the world's oceans.	Eriksen, Marcus, et al. "Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea." *PLOS ONE*, Dec. 2014, [Link]
The bottom of the ocean has between 34 and 57 times more microplastic than the surface. It is estimated that over 30 billion pounds of microplastics reside on the ocean floor.	Barrett, Justine, et al. "Microplastic Pollution in Deep-Sea Sediments From the Great Australian Bight." *Frontiers in Marine Science*, Oct. 2020, [Link]
Effects of plastic:	
Plastic pollution has lethal effects on marine life, from coral to whales. The effects include entanglement, starvation, drowning, tissue damage, oxygen and light deprivation, physiological stress, and toxicological harm from plastic-related chemicals.	McGlade, Jacqueline. *From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution*. United Nations Environment Program (UNEP), 2021, [Link]
Plastic may be limiting the ocean's ability to absorb carbon, accelerating climate change.	Sidik, Saima. "'A Double-Whammy Problem': How Plastic Dust Is Altering Natural Processes." *Nature*, Aug. 2025. [Link]
The economic costs of ocean plastic are estimated to have been at least $6 billion to $19 billion globally in 2018, when considering impacts on tourism, fisheries, and aquaculture, as well as the cost of cleanup efforts.	McGlade, Jacqueline. *From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution*. United Nations Environment Program (UNEP), 2021, [Link]
Fishing gear:	
Abandoned, lost, or otherwise discarded fishing gear, or ghost fishing gear, is a major contributor to	Li, W. C., et al. "Plastic Waste in the Marine Environment: A Review of

ocean plastic pollution. Recent estimates are that nearly 2% of all fishing gear is lost to the ocean annually. Given the scale of the global fishing industry, this amount accumulates quickly — fishing gear accounts for about 20% of total marine plastic pollution.

Sources, Occurrence and Effects." *Science of The Total Environment*, Oct. 2016, [Link]

Richardson, Kelsey, et al. "Global Estimates of Fishing Gear Lost to the Ocean Each Year." *Science Advances*, Oct. 2022, [Link]

Researchers estimated that between 75% and 86% of the weight of floating plastic debris in the Great Pacific Garbage Patch originates from fishing and aquaculture activities. The most common items include buoys, fish crates, nets, and ropes.

Lebreton, L., et al. "Evidence That the Great Pacific Garbage Patch Is Rapidly Accumulating Plastic." *Scientific Reports*, Mar. 2018, [Link]

Plastic's Impact on Fish, Birds, and Other Wildlife

General:	***Source***
Microplastics have been found in nearly all types of wildlife examined — at least 1,565 different species thus far — across terrestrial, freshwater, and marine environments, including mammals, birds, fish, amphibians, reptiles, and invertebrates..	Santos, Robson G., et al. "Plastic Ingestion as an Evolutionary Trap: Toward a Holistic Understanding." *Science*, July 2021, [Link]
The biggest threat plastic poses to wildlife is that animals will ingest the plastic, which can lead to blockages, suffocation, internal damage, malnutrition/starvation, or chemical toxicity. Other threats include entanglement and incorrect usage (e.g., as nesting material or shelter).	Blettler, Martín C. M., and Clara Mitchell. "Dangerous Traps: Macroplastic Encounters Affecting Freshwater and Terrestrial Wildlife." *Science of The Total Environment*, Dec. 2021, [Link]
Birds:	
In 2015 it was estimated that 90% of seabirds had plastic in their stomachs with an expected increase to 99% of seabirds by 2050.	Wilcox, Chris, et al. "Threat of Plastic Pollution to Seabirds Is Global, Pervasive, and Increasing." *Proceedings of the National Academy of Sciences*, Sept. 2015, [Link]
Birds often mistake plastic for prey, or use it as nesting material.	Wang, Limin, et al. "Birds and Plastic Pollution: Recent Advances." *Avian Research*, Nov. 2021, [Link]
Plastic ingestion is a leading cause of death among California condor babies, a critically endangered species.	Rideout, Bruce A., et al. "Patterns of Mortality in Free-Ranging California Condors (*Gymnogyps Californianus*)." *Journal of Wildlife Diseases*, Jan. 2012, [Link]
Plastic chemical additives have been found to accumulate in various bird species.	Wang, Limin, et al. "Birds and Plastic Pollution: Recent Advances." *Avian Research*, Nov. 2021, [Link]
Fish:	

Microplastics have been found in every Great Lakes fish eaten by humans that's been tested, with some fish carrying more than 1,000 particles.	Milne, Madeleine H., et al. "Microplastics and Anthropogenic Particles in Recreationally Caught Freshwater Fish from an Urbanized Region of the North American Great Lakes." *Environmental Health Perspectives*, July 2024, [Link]
Microplastics can have a range of effects on freshwater fish, including altering feeding behavior and digestion, limiting reproduction, and compromising immunity.	Hossain, Mostafa A. R., and Julian D. Olden. "Global Meta-Analysis Reveals Diverse Effects of Microplastics on Freshwater and Marine Fishes." *Fish and Fisheries*, 2022, [Link]
Small plastics can stick to the gills of fish and amphibians and block them, making it harder for them to breathe.	Azevedo-Santos, Valter M., et al. "Plastic Pollution: A Focus on Freshwater Biodiversity." *Ambio*, July 2021, [Link]
Ghost nets (abandoned, lost, or discarded fishing gear) pose a major threat to fish and other marine and freshwater animals, often causing entanglement that can cause injury, starvation, or death.	Wasave, Suhas, et al. "A Bibliometric Review on Ghost Fishing: Impacts on Marine Environment and Governing Measures." *Marine Pollution Bulletin*, Mar. 2025, [Link]

The Myth of Plastics Recycling

View Beyond Plastics report, The Real Truth about the U.S. Recycling Rate (May 2022)

	Source
The U.S. plastics recycling rate was between 5% and 6% in 2021.	*The Real Truth About the U.S. Plastics Recycling Rate*. Beyond Plastics, May 2022, [Link]
Only 9% of all the plastic waste ever generated globally has been recycled.	Geyer, Roland, et al. "Production, Use, and Fate of All Plastics Ever Made." *Science Advances*, July 2017, [Link]
Plastics are not designed to be recycled because they contain so many varied "ingredients," including different polymers, chemical additives, and dyes.	Singh, Nisha, and Tony R. Walker. "Plastic Recycling: A Panacea or Environmental Pollution Problem." *Npj Materials Sustainability*, Aug. 2024, [Link]
The vast majority of recycled plastic cannot be used for food and beverage packaging because of high toxicity risk.	*Assessing the State of Food Grade Recycled Resin in Canada & the United States*. Environment and Climate Change Canada and Stina Inc., 2021. Food Grade Recycled Resin. [Link]
Recycled plastic costs more than virgin plastic because the expansion of virgin plastic production is keeping the prices of new, virgin plastic low.	Sanzillo, Tom, et al. *Impact on Virgin vs. Recycled Plastics Prices and Implications for a Production Cap*. Institute for Energy Economics and Financial Analysis, 22 Nov. 2024, [Link]
Plastic has replaced other packaging materials (e.g., paper, metal, glass) that are actually recyclable, giving consumers little choice but to buy products packaged in plastic.	Resource Recycling Inc., *Data Corner: The evolving ton over 25 years*, Published: Oct 29, 2018, Updated: January 17, 2019, [Link]

Resin Codes and Common Uses

The numbers inside the chasing arrows on the bottom of plastic containers tell you the type of plastic resin used (Association of Plastic Recyclers). Resin is raw plastic material before any chemicals have been added to it, and before it has been made into a product. Contrary to popular belief, **the inclusion of resin codes and the chasing arrows symbol does *not* necessarily mean that the package is recyclable**. Examples of common uses for the major resin types:

Resin Code	Full Polymer Name	Product Examples
#1 PET	polyethylene terephthalate	water, soda, and other beverage/food bottles and jars; polyester clothing and carpets; and automotive parts
#2 HDPE	high-density polyethylene	bottles, jugs, and jars for laundry detergent, milk, and personal care items; trash bags; pipes; and toys
#3 PVC	polyvinyl chloride	vinyl flooring, siding, windows, doors, and pipes; shower curtains; children's toys; clothing; and shoes
#4 LDPE	low-density polyethylene	grocery, newspaper, and dry-cleaning bags; cling wrap; six-pack rings; squeezable bottles; and tubing
#5 PP	polypropylene	clear drink cups, yogurt and margarine tubs, and condiment bottles; auto parts; clothing; and plastic furniture
#6 PS	polystyrene and expanded polystyrene (EPS, foam)	drink cups, takeout containers, and coolers; and protective packaging
#7 Mixed or other plastic	mixed or other plastic	includes acrylic, nylon, polycarbonate, bioplastics, polyurethane, and co-polyesters; and multi-material goods and packaging

Problems with Landfills

	Source
About half of all plastic waste is landfilled.	*Policy Scenarios to 2060*. OECD, 21 June 2022, Global Plastics Outlook. Page 29, [Link]
The U.S. produced 80 billion pounds of municipal plastic waste in 2021, at least 85% of which was sent to landfill sites.	Lin, Xiaoxing, et al. "A Landfill Serves as a Critical Source of Microplastic Pollution and Harbors Diverse Plastic Biodegradation Microbial Species and Enzymes: Study in Large-Scale Landfills, China." *Journal of Hazardous Materials*, Sept. 2023, [Link]
Plastics in landfills contribute to water pollution and the release of toxic gases, as well as an increase in microplastic pollution.	Wojnowska-Baryła, Irena, et al. "Plastic Waste Degradation in Landfill Conditions: The Problem with Microplastics, and Their Direct and Indirect Environmental Effects." *International Journal of Environmental Research and Public Health*, Oct. 2022, [Link]
Wind moving through landfills picks up plastic debris and microplastics and carries them through the air to contaminate the wider environment.	Wojnowska-Baryła, Irena, et al. "Plastic Waste Degradation in Landfill Conditions: The Problem with Microplastics, and Their Direct and Indirect Environmental Effects." *International Journal of Environmental Research and Public Health*, Oct. 2022, [Link]
As plastic breaks apart in the landfill, it can release toxic gases, including methane, volatile organic compounds (VOCs), dioxins, styrene, and carbon monoxide. For example, low-density polyethylene (LDPE) emits methane two times more and ethylene 76 times more when exposed to air than when exposed to water.	Royer, Sarah-Jeanne, et al. "Production of Methane and Ethylene from Plastic in the Environment." *PLOS ONE*, Aug. 2018, [Link]

Problems with Incinerators

	Source
Burning plastic is one of the highest emitters of greenhouse gases in energy production. Compared to the national grid average, incinerators emit 3.8 times more greenhouse gases.	Oceana*, Burning plastic is not a recycling solution; it's more pollution.* July 2022. [Link] Tangri, Neil. "Waste Incinerators Undermine Clean Energy Goals." *PLOS Climate*, June 2023, [Link]
Aside from climate-damaging emissions, incinerators release toxic chemicals that harm human health, including carcinogens and plastic additives associated with severe health risks.	Tait, Peter W., et al. "The Health Impacts of Waste Incineration: A Systematic Review." *Australian and New Zealand Journal of Public Health*, Feb. 2020, [Link]
Burning garbage does not eliminate the need for landfills because it creates incinerator ash. For every three pounds of garbage that is burned, nearly one pound of toxic ash is created. This ash re-enters the environment and can contaminate the food chain.	Energy Justice Network, *Trash Incinerator Ash – Nearly 30 tons for every 100 tons burned*, Aug. 2025, [Link] Petrlik, Jindrich, and Lee Bell. *Toxic Ash Poisons Our Food Chain*. IPEN, Feb. 2020, [Link]
According to a 2019 study, 79% of municipal solid waste incinerators in the U.S. are located in environmental justice communities.	Baptista, Ana Isabel, and Adrienne Perovich. *U.S. Municipal Solid Waste Incinerators: An Industry in Decline*. The New School, May 2019, [Link]
In 2016, it was estimated that 11.3 million tons of plastic were incinerated in the European Union — a 61% increase in a decade.	Lee, Bell, and Hideshige Takada. *Plastic Waste Management Hazards: Waste-to-Energy, Chemical Recycling, and Plastic Fuels*. International Pollutants Elimination Network (IPEN), June 2021, [Link]

Problems with Chemical Recycling

View Beyond Plastics fact sheet and report Chemical Recycling: A Dangerous Deception (October 2023)

Definition:	***Source***
The term “chemical recycling” has no formal definition but refers to a diverse set of chemical engineering technologies that subject plastic waste to a combination of heat, pressure, and/or other chemicals inside a reaction vessel to produce fuels, chemical feedstocks, and sometimes new plastics.	Rollinson, Andrew N., and Jumoke Oladejo. *Chemical Recycling: Status, Sustainability, and Environmental Impacts*. Global Alliance for Incinerator Alternatives (GAIA), 2020, [Link]
These technologies are known by many names, including advanced recycling, molecular recycling, gasification, pyrolysis, waste-to-fuel, solvolysis, methanolysis, and thermal demanufacturing.	Rollinson, Andrew N., and Jumoke Oladejo. *Chemical Recycling: Status, Sustainability, and Environmental Impacts*. Global Alliance for Incinerator Alternatives (GAIA), 2020, [Link]
Challenges:	
So-called “chemical recycling” is inefficient and energy-intensive, and it contributes to climate change. The energy needs (derived from plastic waste, itself or additional fossil fuels) of chemical recycling can create as much as 100 times more damaging environmental and climate impacts than virgin plastic production.	Bell, Lee, and Jenny Gitlitz. *Chemical Recycling: A Dangerous Deception*. Beyond Plastics and International Pollutants Elimination Network (IPEN), Oct. 2023, [Link] Uekert, Taylor, et al. “Technical, Economic, and Environmental Comparison of Closed-Loop Recycling Technologies for Common Plastics.” *ACS Sustainable Chemistry & Engineering*, Jan. 2023, [Link]
Even with the most advanced forms of pyrolysis and gasification, very little of the plastic waste processed actually becomes new plastic. Due to the complex chemical makeup of plastics and the challenges of securing a clean, sorted, homogenous source of waste plastics, many so-called “chemical recycling” facilities end up selling their outputs as fuel or burning them in-house to fuel the chemical recycling process, itself.	Rollinson, Andrew N., and Jumoke Oladejo. *Chemical Recycling: Status, Sustainability, and Environmental Impacts*. Global Alliance for Incinerator Alternatives (GAIA), 2020, [Link]

In 2023, petrochemical companies globally announced 2 million metric tons of toxic plastic breakdown capacity by 2027 — through a total of 38 facilities — but only 0.4 million metric tons of this would be generating recycled plastic (80% of the planned capacity would produce fuels).	Charles, Dominic, and Laurent Kimman. *Plastic Waste Makers Index 2023*. Minderoo Foundation, 2023, [Link]

U.S. Facilities:

As of late 2025, there were fewer than ten chemical recycling facilities operating in the United States. Most are not operating at the levels they were originally designed to reach, and, even if they were, they would only be able to process about 1% of the plastic waste generated in the U.S.	Bell, Lee, and Jenny Gitlitz. *Chemical Recycling: A Dangerous Deception*. Beyond Plastics and International Pollutants Elimination Network (IPEN), Oct. 2023, [Link] Oil & Gas Watch, Environmental Integrity Project, accessed 2025, [Link]
As of June 2025, there were 38 plants proposed for construction in the United States, with notable concentrations in Ohio, Louisiana, and Texas.	Oil & Gas Watch, *Fact Sheet; Chemical Recycling*, Last Updated: Aug 2025, [Link]
Pyrolysis, which is a process of thermally degrading waste using high heat, accounts for almost 80% of both proposed and operating "chemical recycling" facilities in the United States. Yet pyrolysis actually can't recycle much, if any, plastic. Instead, it mostly produces dirty fuels for a single use.	Sharp, Renee, et al. *More Recycling Lies: What the Plastics Industry Isn't Telling You About "Chemical Recycling."* Natural Resources Defense Council (NRDC), Mar. 2025, [Link]
Most "chemical recycling" facilities in the U.S. are located in low-income communities and communities of color.	Sharp, Renee, et al. *More Recycling Lies: What the Plastics Industry Isn't Telling You About "Chemical Recycling."* Natural Resources Defense Council (NRDC), Mar. 2025, [Link]
So-called chemical recycling creates toxic waste. Most of the plastics going into chemical recycling facilities will become waste (often hazardous waste) to be burned as fuel or landfilled.	Bell, Lee, and Jenny Gitlitz. *Chemical Recycling: A Dangerous Deception*. Beyond Plastics and International Pollutants Elimination Network (IPEN), Oct. 2023, [Link]

Associated dangers:

Chemical recycling facilities are prone to fires and explosions, as are the massive piles of plastic waste that are stored on- or off-site.	Rollinson, Andrew N. "Fire, Explosion and Chemical Toxicity Hazards of Gasification Energy from Waste." *Journal of Loss Prevention in the Process Industries*, July 2018, [Link]
Different chemical and solvent-based methods of so-called "chemical recycling" carry their own highly toxic footprints.	Sharp, Renee, et al. *More Recycling Lies: What the Plastics Industry Isn't Telling You About "Chemical Recycling."* Natural Resources Defense Council (NRDC), Mar. 2025, [Link]
Fuels obtained from pyrolysis can be toxic. One of the chemical mixtures — approved by the U.S. EPA in 2023 and intended to be used as jet fuel — was estimated to pose a one in four cancer risk (meaning that one in every four people regularly exposed to it throughout their life would likely develop cancer).	Sharp, Renee, et al. *More Recycling Lies: What the Plastics Industry Isn't Telling You About "Chemical Recycling."* Natural Resources Defense Council (NRDC), Mar. 2025, [Link]

Problems with Bioplastics (e.g., Biodegradable and Compostable Plastic)

View Beyond Plastics [fact sheet] (June 2025) and report [Demystifying Compostable and Biodegradable Plastics] (July 2024)

Definition:	***Source***
The word "bioplastics" does not have a standardized definition and is often used to refer to plastic that is biobased, biodegradable, and/or compostable. This umbrella term also includes fossil fuel-based plastic.	*Demystifying Compostable and Biodegradable Plastics*. Beyond Plastics, July 2024, [Link]
Biobased plastic refers to plastic made not from fossil-fuel building blocks but from plant material, such as corn, cassava, beets, and sugarcane.	*Demystifying Compostable and Biodegradable Plastics*. Beyond Plastics, July 2024, [Link]
"Biodegradable" plastic refers to a product that can break apart naturally in the environment, but without a specific timeline. Depending on the product, it can take months to years to centuries.	*Bioplastics: Facts and Figures*. European Bioplastics, 2022, [Link] Kolstad, Jeffrey J., et al. "Assessment of Anaerobic Degradation of Ingeo™ Polylactides under Accelerated Landfill Conditions." *Polymer Degradation and Stability*, July 2012, [Link]
General:	
Packaging accounts for over half of biobased plastic production.	Siracusa, Valentina, and Ignazio Blanco. "Bio-Polyethylene (Bio-PE), Bio-Polypropylene (Bio-PP) and Bio-Poly(Ethylene Terephthalate) (Bio-PET): Recent Developments in Bio-Based Polymers Analogous to Petroleum-Derived Ones for Packaging and Engineering Applications." *Polymers*, July 2020, [Link]
Some "biodegradable" plastic, like PBAT, is made entirely from fossil fuels.	Tullo, Alexander H. "The Biodegradable Polymer PBAT Is Hitting the Big Time." *Chemical & Engineering News*, 21 Jan. 2025, [Link]

While certified “compostable” plastics are engineered to fully decompose within 12 weeks under the controlled conditions of a commercial composting facility, most U.S. communities do not have access to such facilities and the majority of the country’s commercial and municipal composters do not accept compostable packaging.

U.S. EPA, *Frequently Asked Questions about Plastic Recycling and Composting*, Nov 2024, Accessed Aug 2025
Demystifying Compostable and Biodegradable Plastics. Beyond Plastics, July 2024, [Link]

Kachook, Olga, “Composting Facilities in the United States, Tableau Public”, Published: March 2020, Updated: June 2023, Accessed: Sept 2025, [Link]

Bioplastic’s potential climate benefit is undermined by burning forests to clear land for corn or sugarcane production; diverting water and land resources to grow the crops used for the feedstock, the increased use of fertilizers and pesticides; and the chemicals and energy used in processing.

Rosenboom, Jan-Georg, et al. “Bioplastics for a Circular Economy.” *Nature Reviews Materials*, Feb. 2022, [Link]

Tabone, Michaelangelo D., et al. “Sustainability Metrics: Life Cycle Assessment and Green Design in Polymers.” *Environmental Science & Technology*, Nov. 2010, [Link]

Toxicity:

Bioplastics are often made using the same processes as traditional plastics, which means they may contain any of the same 16,000-plus chemicals, more than a quarter of which are known to be harmful.

Demystifying Compostable and Biodegradable Plastics. Beyond Plastics, July 2024, [Link]

Monclús, L., et al. “Mapping the Chemical Complexity of Plastics.” *Nature*, July 2025, [Link]

In general, even less is known about the potential toxicity of chemicals used to create bioplastics than those used in conventional plastics, as many are new and manufacturers tend to keep this proprietary information a trade secret.

Zimmermann, Lisa, et al. “Are Bioplastics and Plant-Based Materials Safer than Conventional Plastics? *In Vitro* Toxicity and Chemical Composition.” *Environment International*, Dec. 2020, [Link]

Plastics and Agriculture

Prevalence:	***Source***
As many as 600 million pounds of microplastics end up on North American farmlands each year.	Nizzetto, Luca, et al. "Are Agricultural Soils Dumps for Microplastics of Urban Origin?" *Environmental Science & Technology*, Oct. 2016, [Link]
It was estimated that the European Union released between four and 23 times more plastic into land than into ocean, contaminating agricultural soil.	Horton, Alice A., et al. "Microplastics in Freshwater and Terrestrial Environments: Evaluating the Current Understanding to Identify the Knowledge Gaps and Future Research Priorities." *Science of The Total Environment*, May 2017, [Link]
In 2019, the agricultural industry used 27 billion pounds of plastic products, accounting for almost 3.5% of global plastic production that year.	*Assessment of Agricultural Plastics and Their Sustainability. A Call for Action*. Food and Agriculture Organization (FAO) of the United Nations, 2021, [Link]
Sources:	
Agricultural practices like plastic film mulching, sewage sludge composting, seed coatings, plastic seedling trays, and wastewater use can add to plastic pollution.	*Assessment of Agricultural Plastics and Their Sustainability. A Call for Action*. Food and Agriculture Organization (FAO) of the United Nations, 2021, [Link]
Plastic can also enter soil from rain, runoff, and car tires, and can even be carried in the air.	*Assessment of Agricultural Plastics and Their Sustainability. A Call for Action*. Food and Agriculture Organization (FAO) of the United Nations, 2021, [Link]
Sewage sludge:	
Wastewater treatment plants can capture up to 90% of microplastics, which then get concentrated in "sewage sludge," which is used as low-cost compost on farms. In one study, sludge application increased microplastic abundance in the soil by seven to 14 times, and remained high for the 20 years studied.	Ramage, Stuart J.F.F., et al. "Microplastics in Agricultural Soils Following Sewage Sludge Applications: Evidence from a 25-Year Study." *Chemosphere*, May 2025, [Link]

Sludge application also contaminates farmland with PFAS — "forever chemicals" that can be added to plastics to make them waterproof or stain-proof — which can, in turn, contaminate produce, animal products, and drinking water.

Perkins, Tom. "Fury over 'Forever Chemicals' as US States Spread Toxic Sewage Sludge." *The Guardian*, 19 Sept. 2022. Environment. *The Guardian*, [Link]

Effects of plastics:

Climate harm*:* Microplastics increase carbon dioxide emissions from soil — for example, compared to uncontaminated soil, the presence of polypropylene microplastics doubles methane emissions.

Zhang, Linjie, et al. "Microplastics and Soil Greenhouse Gas Emissions: A Critical Reflection on Meta-Analyses." *Environmental Science & Technology*, Aug. 2025, [Link]

Soil harm: Microplastics alter soil chemistry, the ability to hold water, and soil biota.

de Souza Machado, Anderson Abel, et al. "Impacts of Microplastics on the Soil Biophysical Environment." *Environmental Science & Technology*, Sept. 2018, [Link]

Human harm*:* In one study, wheat plants grown with microplastics in the soil had 1.5 times more cadmium (a carcinogenic metal that can also harm the kidneys) than wheat plants grown without microplastics.

Cosier, Susan, *A Growing Concern: Microplastic Pollution on Farm Fields*, NRDC, February 2 2021, [Link]

Plant/health harm: Microplastics are taken up by the roots of plants and through their leaves. This can:

- Restrict plant growth;
- Decrease photosynthesis by up to 12%;
- Leach toxics that harm plants; and
- Increase our own exposure when either we, or our livestock, eat the contaminated plants.

Li, Jia, et al. "Effects of Microplastics on Higher Plants: A Review." *Bulletin of Environmental Contamination and Toxicology*, Aug. 2022, [Link]

Zhu, Ruijie, et al. "A Global Estimate of Multiecosystem Photosynthesis Losses under Microplastic Pollution." *Proceedings of the National Academy of Sciences*, Mar. 2025, [Link]

Plastics and Textiles

Waste:	***Source***
Clothing made with synthetic fibers across the world resulted in over 16 billion pounds of plastic waste in 2019.	Kounina, Anna, et al. "The Global Apparel Industry Is a Significant yet Overlooked Source of Plastic Leakage." *Nature Communications*, June 2024, [Link]
Synthetic textiles — like polyester, nylon, acrylic, and spandex — are made from plastic. Mismanaged waste of these synthetic textiles is the main source of plastic waste from the textile industry	Kounina, Anna, et al. "The Global Apparel Industry Is a Significant yet Overlooked Source of Plastic Leakage." *Nature Communications*, June 2024, [Link]
Fourteen percent of total plastic pollution in 2019 came from the global clothing industry.	Kounina, Anna, et al. "The Global Apparel Industry Is a Significant yet Overlooked Source of Plastic Leakage." *Nature Communications*, June 2024, [Link]
Most of the clothing sold in the United States ends up in lower-income countries where the clothing is sold secondhand.	Kounina, Anna, et al. "The Global Apparel Industry Is a Significant yet Overlooked Source of Plastic Leakage." *Nature Communications*, June 2024, [Link]
Eighty-five percent of textiles in the United States that were thrown away went to landfills or incinerators.	Schumacher, Kelsea, and Amanda L. Forster. *Facilitating a Circular Economy for Textiles Workshop Report*. National Institute of Standards and Technology (NIST), U.S. Department of Commerce, May 2022, [Link]
Fast fashion:	
Fast fashion refers to inexpensive clothing produced rapidly by mass-market retailers in response to the latest trends. The amount of clothing produced between 2000 and 2020 doubled.	Niinimäki, Kirsi, et al. "The Environmental Price of Fast Fashion." *Nature Reviews Earth & Environment*, Apr. 2020, [Link]
Fossil-fuel based fibers account for over two-thirds (69%) of textile production, with a projected increase to 73% by 2030.	Trunk, Urska, et al. *Fashion's Plastic Paralysis: How Brands Resist Change and Fuel Microplastic Pollution*. Changing Markets Foundation, Sept. 2024, [Link]

Microplastics:

A typical laundry load of polyester clothing is estimated to release over 6 million microplastic particles.	De Falco, Francesca, et al. "Evaluation of Microplastic Release Caused by Textile Washing Processes of Synthetic Fabrics." *Environmental Pollution*, May 2018, [Link]
About 35% of "primary" microplastics in the oceans (excluding *"secondary"* microplastics that come from the breakup of bigger plastics) comes from the laundering of synthetic textiles.	Boucher, Julien, and Damien Friot. *Primary Microplastics in the Oceans: A Global Evaluation of Sources*. International Union for Conservation of Nature (IUCN), 2017, [Link]
Washing-machine filters specifically designed to capture microplastics can reduce the amount of microfibers entering the environment by up to 90% (Ocean Conservancy 2025, and Marine Pollution Bulletin 2019). Hang-drying clothes on a clothesline instead of using a dryer can also reduce microplastics and save energy (ES&T 2022).	*Fibers to Filters: A Toolkit for Microfiber Solutions*. Ocean Conservancy, The 5 Gyres Institute, and The Nature Conservancy, June 2024, [Link] McIlwraith, Hayley K., et al. "Capturing Microfibers – Marketed Technologies Reduce Microfiber Emissions from Washing Machines." *Marine Pollution Bulletin*, Feb. 2019, [Link] Tao, Danyang, et al. "Microfibers Released into the Air from a Household Tumble Dryer." *Environmental Science & Technology Letters*, Feb. 2022, [Link]

Health/toxics:

Plastic-based textiles contain various toxic additives like PFAS, phthalates, flame retardants, and azo dyes (carcinogenic dyes).	See Chemicals Used in Plastics
Polyester-spandex socks and athletic wear were found to have BPA levels up to 19 times California's safety limit.	Center for Environmental Health (CEH), *What You Need to Know About BPA in Clothing*, Feb 24 2023, [Link]
In one study, one in five pieces of children's clothing tested contained elevated levels of toxic chemicals.	Cowley, Jenny, et al. "Experts Warn of High Levels of Chemicals in Clothes by Some Fast-Fashion Retailers." *CBC News*, 1 Oct. 2021, [Link]

PFAS is highly prevalent in stain- and water-resistant clothing. A study found that children wearing stain-resistant uniforms would be exposed to 1.03 parts per billion of PFAS per kilogram of body weight per day through their skin.

Xia, Chunjie, et al. “Per- and Polyfluoroalkyl Substances in North American School Uniforms.” *Environmental Science & Technology*, Oct. 2022, [Link]

Plastic and Building Materials

See Beyond Plastics full fact sheet (August 2025)

Prevalence and use:	***Source***
Building materials represent a significant and growing sector of plastic use. Globally, building and construction is the second-highest-use sector for plastics, accounting for 17% of total plastic use.	*Economic Drivers, Environmental Impacts and Policy Options*. OECD, 22 Feb. 2022, Global Plastics Outlook. Page 14. [Link]
Without new policies and practices, the demand for plastic building materials is projected to increase by 2.5 times by 2060 (from 2019 levels).	*Policy Scenarios to 2060*. OECD, 21 June 2022, Global Plastics Outlook. Page 17. [Link]
Products made either wholly or partially from plastic can be found throughout commercial and residential buildings, including the following:	Beyond Plastics, *Plastics in Building Materials & Products*, Aug 2025, [Link]

- **Plumbing:** PEX (medium- or high-density polyethylene), PVC (polyvinyl chloride), and CPVC (chlorinated polyvinyl chloride)
- **Siding:** House wrap membrane (polyethylene) and vinyl siding and trim (PVC)
- **Paint:** Acrylic paints and polyurethanes
- **Insulation:** Expanded polystyrene (EPS) foam insulation and extruded polystyrene (XPS) foam insulation
- **Flooring:** Vinyl sheet flooring, luxury vinyl plank or tiling (PVC), and carpet (e.g., nylon, polypropylene, polyester)
- **Countertops:** Plastic laminates
- **Windows and doors:** PVC
- **Decking:** Composite and PVC decking

Environmental and health harms:	
Data shows that toxic chemicals may leach from polyvinyl chloride (PVC) plastic piping into drinking water, raising concerns about potential human health impacts.	*The Perils of PVC Plastic Pipes*. Beyond Plastics, Apr. 2023, [Link]

Plastic lumber used for decking and benches can reach hot temperatures, posing a burn risk.	Riopelle, Marc. *Real Wood vs. Composite Decking: Why Is Wood Best?,* The Sansin Corporation. Accessed 22 Sept. 2025, [Link]
When sawed, plastic lumber releases very fine plastic particles, like plastic snow, that may pollute soil and water.	Carter, CeCe, *Atlantic City Joins New Jersey Municipalities to Say No to Toxic Construction Particles in Air and Environment*, South Jersey Surfrider Foundation, Feb 20 2025, [Link]
When buildings are burned in structure fires or wildfires, any plastic materials within them release hazardous chemicals, which may harm firefighters and other first responders, and may contaminate nearby soil, water, and biological habitats.	U.S. EPA, *Study Shows Some Household Materials Burned in Wildfires Can be More Toxic Than Others*, March 1 2022, Accessed Sept 2025, [Link]

Waste:

The majority of global plastic building material waste is landfilled or incinerated.	Pickard, Sam, and Samuel Sharp. *Phasing out Plastics: The Construction Sector*. ODI Global, Sept. 2020, [Link]
Discarded carpeting in the U.S., alone, accounts for roughly the same weight of plastic waste as all of the plastic bag, straw, and single-use water bottle waste generated annually in the country.	McGrath, Teresa, et al. *Buildings' Hidden Plastic Problem*. Habitable, Nov. 2024, [Link]

Public Opinion and Poll Numbers

Siena Research - April 2025 - New York state

New York state residents overwhelmingly support policies to reduce single-use plastic packaging.

- 73% support requiring large companies to reduce packaging on their products.
- 61% want the beverage container deposit increased from 5 to 10 cents to increase recycling and reduce pollution.

Oceana - February 2025 - U.S.

Eight out of 10 U.S. voters supported one or more plastic-reduction policies:

- 81% support reducing plastic production overall.
- 80% support local and state policies to reduce single-use plastic foam.
- 78% support national policies to reduce single-use plastic foam.
- 85% support increasing reusable packaging and foodware.
- 80% support requiring companies to reduce single-use plastic packaging and foodware.

Natural Resources Defense Council - 2024 - U.S.

- 89% are concerned about plastic and its impact on air and water pollution.
- 83% are concerned about plastic pollution and its impact on their/their family's health.
- 88% support measures that reduce plastic production by eliminating unnecessary and avoidable plastic.
- 79% believe plastic filling up landfills, polluting waterways, and being burned in incinerators, leading to air pollution, to be a crisis or major problem.

Ipsos/WWF/Plastic Free Foundation - Global - April 2024 (32 countries/24,727 respondents)

- 85% of people polled worldwide believe a global plastic pollution treaty should ban single-use plastics.

Greenpeace - April 2024 - Global (19 countries/19,000 respondents)

- 82% support cutting the production of plastic.
- 80% support protecting biodiversity and the climate by cutting plastic production.
- 90% support a transition away from single-use plastic packaging to reusable and refillable packaging.
- 75% support a ban on single-use plastic.
- 80% are concerned about the impacts of plastic on the health of their loved ones.
- 84% of parents are concerned about these impacts on the health of their children.

Ocean Conservancy - 2024 - U.S.

- 78% of Americans consider plastic pollution to be the most pressing problem for the health of our ocean.