LEAGUE OF WOMEN VOTERS®
OF INDIANA COUNTY

# PLASTIC

**A short history of plastic, its impact on our planet, and ways to reduce your plastic footprint.**

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# INTRODUCTION

Plastic is so common today that it's difficult to imagine what life would be like without it. Since plastic was first mass-produced almost 100 years ago, its uses have multiplied. It has made life more convenient, sanitary, safer, and cheaper. Plastic has forever changed our lives.

This sounds good until you consider that plastic never really goes away. It can last 100 to 1,000 years -- or longer. As a result, plastic is piling up in the environment, absorbing toxic chemicals along the way. Ultimately, plastic enters the food web, threatening the planet and every living organism.

In Indiana County, the first recycling program was started by a group called "Pollution Solution." At the time, recycling was not mandatory. Dedicated volunteers ran the non-profit organization.

The volunteers opened for business after securing a location to collect recycled materials (courtesy of the Indiana County Commissioners). They also found companies that would buy and reuse recycled materials.

Today, recycling is the responsibility of the Indiana County Solid Waste Authority, established in 1988 by PA Act 101.

This booklet is designed to show the magnitude of today's problem and to encourage *you* to become involved in finding solutions.

Together we **can** make a difference.

Environmental Issues Committee --

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## THE EARLY PLASTICS INDUSTRY


DuPont advertisement.
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Plastic was invented in the late 1800s by chemists looking for a durable material suitable for various uses. Early plastic goods included “nylons,” which became a fashion statement for the modern woman in the 1920s and 30s.

Later, during World War II, plastics were used to produce lightweight weapons and parachutes. Saran Wrap was also a WWII invention!

After the war, chemical companies like DuPont, Dow Chemical, Monsanto, and Union Carbide launched massive advertising campaigns promoting the new product. “Better Living Through Chemistry" became a well-known slogan.

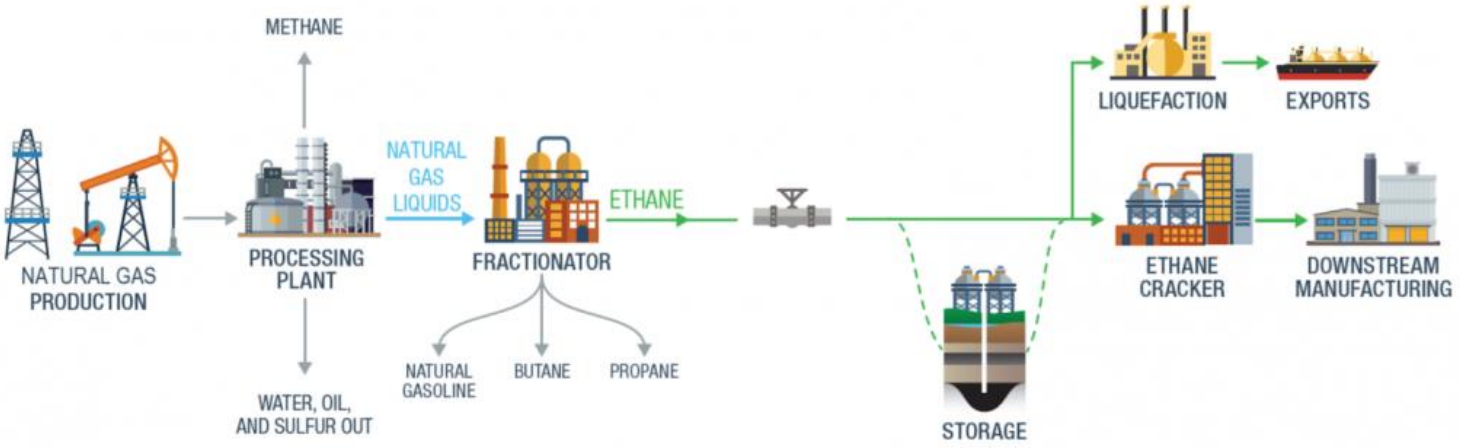
Eventually, polyester clothing became a cheap substitute for natural fibers like wool and cotton. Chemical engineers created many new products, from car parts to vinyl siding and drainage pipes, phones, rugs, clothing, toothbrushes, and the universal plastic bottle. While plastics can be made from agricultural products like soy, corn, and hemp, most plastics today are made from crude oil or ethane in natural gas.

## MAKING PLASTICS FROM NATURAL GAS LIQUIDS

Western Pennsylvania’s Marcellus Shale deposits have an unusually high proportion of ethane gas (10 –15%). As a result, western Pennsylvania has become particularly attractive to plastics manufacturers. But to convert ethane into plastic requires a series of chemical and refining processes.

When oil drillers find ethane, it is generally mixed with other gasses, including methane, used to heat our homes. Until recently, these gasses were flared off because there was no easy way to transport them to a facility where they could be recovered.

To separate the gas mixture into its parts, it must be exposed to extremely low temperatures (approximately minus 148 ° Fahrenheit). At this temperature, the gasses become liquid, and the ethane can be separated out of the mix. The liquid ethane is then shipped to a “cracker plant” to be converted into plastic.




Manufacturing of plastics from natural gas. Used with permission from [fractracker.org](fractracker.org)

## THE MARCELLUS SHALE EFFECT

The chemical industry has long been concentrated on the Gulf Coast, where oil and gas deposits were discovered decades ago. But recently, the Gulf Coast has become more susceptible to “extreme weather events “(namely hurricanes and sea level rise), inhibiting further expansion.

Now, with the abundant ethane to be found in the Shale Crescent – as the Marcellus Shale area is known– chemical companies have settled on this area to develop the plastic industry. The upper Ohio Valley is already home to chemical companies such as PPG, Dow Chemical, and BASF.

Pennsylvania gave Shell Oil Company a $1.65 billion state tax credit, the largest in state history, to help build a “cracker plant” in Beaver County. This was in addition to other state and local tax breaks. After ten years of planning and construction, the facility began operations in November 2022.

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Photo by Tom Fontaine, Tribune-Review

## THE CRACKER PLANT – FROM GAS TO NURDLES

The “Falcon” pipeline supplies the Beaver County plant to bring ethane to the facility from Houston, PA, Scio, Ohio, and Cadiz, Ohio. During the Falcon pipeline construction for the Beaver County cracker plant, Shell was fined $670,000 for violations involving spilled drilling fluids, sediment leaks, lack of erosion control, and failure to notify the DEP. As of Feb 2023, DEP has already issued three violation notices for exceeding emissions standards.

Shell Oil Company opened its ethylene cracker plant, Shell Polymers Monaca, in Potter Township, Beaver County, Pennsylvania, in November 2022. There are seven high-temperature furnaces where the raw ethane molecules are converted into ethylene molecules. The ethylene molecules are then chemically treated to bond with each other to form long chains of polyethylene and other plastic materials.

Propane gas is separated in a distilling tower to operate an on-site co-generation plant. The non-marketable gasses are flared off. The three polyethylene production lines are serviced by shipping and receiving facilities, warehouses, labs, and administrative buildings.

*Nurdles.* Photo by V. Bonnet

The final product of the cracker plant will be tiny plastic pellets, known in the industry as "nurdles." Easier and safer to transport than flammable, compressed gas, these solid pellets are shipped to manufacturers. They will be melted down and treated with colorants and other chemicals to produce an end product suitable for multiple everyday uses.

But the processing continues even after the nurdles are shipped from the cracker plant. To give each product the desired final qualities – durability, flexibility, color, etc. -- requires the addition of a slurry of chemical dyes and additives.

And accidents happen despite the best precautions mandated by state and federal agencies. Commercial ships carrying shipping containers full of nurdles have been lost at sea. Pellets have been found in the stomachs of fish and birds, endangering the animals and the entire food chain.

## THE BEAVER COUNTY CRACKER PLANT

As of March 2023, the Pennsylvania Department of Environmental Protection (DEP) has cited the plant three times for exceeding pollution emission limits. This is alarming because the plant was not yet fully operational. Shell is restricted from emitting more than 516.2 tons of volatile organic compounds (VOC) and 328.5 tons per month of nitrogen oxide, according to the DEP. In November, the cracker plant emitted 716.6 tons of volatile organic compounds. In December, the plant emitted 741.5 tons of volatile organic compounds and 345.4 tons of nitrogen oxide.

Breathing nitrogen oxides can cause or worsen respiratory illness and lung disease, and these gasses may react with VOCs to form particle pollution. Breathing VOCs, such as benzene, can cause respiratory irritation, difficulty breathing, nausea, and skin irritation. Those exposed to very high levels of VOCs risk organ and central nervous system damage and certain types of cancer.

Ethylene is the most-produced petrochemical. It is the root chemical for a kingdom of plastics, resins, adhesives, and synthetic products used in virtually every aspect of modern life. Ethylene is used as the basis for plastics like beverage containers, food wraps, polyvinyl chloride (PVC), polyester, and chemicals like those found in antifreeze, solvents, urethanes, and pharmaceuticals.

Flaring events have happened at Shell Polymers Monaca. Flaring is the burning off of gasses to keep them from being released into the atmosphere. A malfunction at the plant on February 13, 2023, prompted elevated flaring, with thick flames and black smoke filling the sky above the facility for hours. In the flaring, Benzene was released into the atmosphere. Benzene is a building block in the production of petrochemicals. A highly flammable substance made of six hydrogen molecules and six carbon molecules, benzene has been recognized as a human carcinogen. Exposure to benzene may occur through inhalation near industrial facilities, like petrochemical plants, that use it in their processing. Since it is also a significant component of gasoline, inhalation of benzene is possible at gas stations and via cigarette smoking. Some immediate signs of high blood levels of benzene include drowsiness, dizziness, and confusion. Aside from cancer, long-term exposure to benzene may result in irregular menses in women, anemia, and immunosuppression.

## MICROPLASTIC: FROM TINY FIBERS TO FLOATING ISLANDS

The useful life of plastic bottles and other single-use plastic products is very short. These products are designed to be used only one time then discarded. However, the plastic remains for decades or even centuries!

**Microplastic defined:**

- Microplastics are less than five millimeters or 0.2 inches long (or about the size of a single sesame seed).
- Microplastics are not biodegradable.
- Microplastics may absorb and contain harmful chemicals: They could have up to 7% of chemicals and additives, such as insecticides, PCBs and mercury, known carcinogens, and endocrine disruptors. They have been found in human breast milk.

- They can contain bacteria and organic pollutants that pollute groundwater and food sources and affect organism behavior.

**Where do they come from, and where are they found:**

- They are often broken down from larger plastics, such as macro plastic items, by the sun, wind, or water (bottles, toothbrushes, plastic silverware, etc).
- Microbeads can break down into microplastics (such as those in toothpaste or facial scrubs).
- Nurdles or pellets used to make other plastic products accidentally introduced into the environment can break down into microplastics.
- When synthetic textiles such as nylon, spandex, polyester, and rayon are washed, microplastics are shed and go into the wastewater plants that cannot filter them out. Some microplastics go into our local streams and rivers. They are the most significant source of plastics in the ocean.
- Eroding tires, dust, marine coatings, and road markings (polymer tape and paint) can also produce microplastics.

**Things we can do to avoid microplastics**

Humans consume about five grams of tiny plastic particles every week, which is about the weight of a credit card. To avoid consuming microplastic:

- Microwave food in glass or porcelain dishes instead of plastic containers.
- Ventilate your house; it can help minimize plastic particles' ingestion.
- Avoid plastic packaging when buying food.
- Drink filtered tap water to decrease the ingested particles compared to bottled water.
- Avoid synthetic fibers and use natural materials like wool, silk, and hemp.
- Support policies that limit or ban single-use plastics.
- Use reusable products like reusable bottles and mugs.
- Bring reusable containers and bags with you to restaurants and stores.
- Ask your lawmakers what they are doing to stop the flow of microplastics.
- Download the ‘My Little Plastic Footprint’ app to get tips to reduce your plastic footprint and learn more about items that contribute to plastic pollution.

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# MICROPLASTICS IN THE OCEAN

There are two types of microplastic pollutants in our oceans. Primary microplastics, or microbeads, are designed to be small and used to exfoliate or cleanse the human body in facial cleansers, scrubs, toothpaste, and bath products. Microbeads are also used in lotions, deodorants, cosmetics, and non-cosmetic products. The Microbead-Free Waters Act of 2015 (MFWA) prohibited the manufacture of rinse-off cosmetics containing plastic microbeads (2017) and banned the sale of cosmetics (2018) and over-the-counter drugs (2019) containing microbeads. Other countries, including Canada, France, India, New Zealand, Sweden, Taiwan, and the United Kingdom, have at least partial bans on microbeads, but they continue to be produced and used elsewhere. Secondary microplastics are formed from the degradation of larger plastic into particles less than 5 mm, or 0.2 inches, long.

Now that we know what primary and secondary microplastics are, let's explore how they end up in our oceans and why we need to stop the flow. Much of the plastic in the oceans is made of plastic waste from careless dumping on land. Aided by wind, rain, runoff, and storms, the plastic makes its way into rivers and lakes, washing into the ocean at a rate of about nine million tons a year. It sounds like a lot, but how much is nine million tons? Nine million tons is 18,000,000,000 (18 billion) pounds. In perspective, if you stacked 18 billion one-dollar bills, the stack would be over 1200 miles tall! End-to-end, 18-billion one-dollar bills would reach around the Earth seventy times! So, eighteen billion pounds of plastic is an almost unfathomably huge amount going into our oceans, and that’s in just one year. Even more concerning, only about 1% is visible floating on the surface, suggesting that most of the plastic in the ocean is in the form of microplastics and nanoplastics.

Plastic poses many threats to sea life -- we have all seen heartbreaking images of birds, turtles, dolphins, and even whales. In addition, plastic breaks down, or degrades, into smaller and smaller pieces driven by the actions of wind, waves, temperature, and sunlight. The plastic doesn’t decompose like an apple core in a compost pile. It remains in the environment indefinitely; it merely gets broken into smaller and smaller pieces. What happens to all these microplastics? Are they harmful to the environment?
Microplastics have been found in every ecosystem on Earth, including oceans from the depths of the Mariana Trench throughout the water column to the surface. Microplastics

not only leach chemicals into the environment but also attract and concentrate heavy metals and organic pollutants 100,000-1,000,000 times the concentration in surrounding seawater. An example is polychlorinated biphenyls (PCBs). Although PCBs have been banned because of their carcinogenic and non-carcinogenic effects on humans, they remain in the environment where they can be concentrated by adsorption to plastic, ingested by small organisms, and moved up the food web, referred to as bioaccumulation.

Although the concentration of heavy metals and organic pollutants is a problem, microplastics are also attracted to naturally occurring, oily slicks of surface water rich in organic compounds, which act as nutrient-rich larval fish nurseries. The most critical moment for larval fish is the first feeding. If successful, they live another day. If that first meal is a piece of microplastic, they are not consuming the calories they need to survive and will most likely perish. Fish provide critical protein for seabirds, other marine animals, and almost three billion people. Fish stocks are already less than half of what they were in 1970, primarily due to overfishing, but they've also fallen prey to pollution and climate change effects. In a study of these slicks and larval fish, researchers found that microplastics outnumbered larval fish by more than seven to one. Compared to water outside slicks, the concentration of plastic was almost 130 times greater. Even if fish survive the larval stage, ingesting plastic as part of their diet can affect size, reproductive ability, and population size.

We need to stop the flow! We cannot keep making and dumping plastic in our oceans! And we need to attack the problem from all directions – by making far less plastic, especially the single-use variety, by passing legislation to make plastic manufacturers responsible for cleaning up the plastic mess they produce, by inventing better ways to remove plastic from the environment, by funding research to find alternatives to plastic. Examples already in the works include scientists at the University of California San Diego developing new biodegradable materials that are designed to replace conventionally used plastic, the development of a so-called nano coil capable of breaking microplastics into carbon dioxide and water, and the development of a magnetic liquid up to 87% efficient in removing microplastics from water.

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# MICROPLASTICS ON LAND AND IN FRESHWATER

While microplastics in the ocean are a pressing environmental issue, they should not overshadow a more significant threat to human, animal, and plant life: microplastics on land, freshwater, and soil. Depending on the location, the concentration of microplastics can be four to 23 times greater on land than in the ocean.

Microplastics on land come from various sources, including cosmetic microbeads, degraded plastic litter, tires, brake pads, damaged agricultural film, and plastic mulching. Degraded plastic pieces continue to degrade into smaller and smaller pieces, releasing more and more of the chemicals associated with the polymer chains. However, the vast majority of microplastics on land are microfibers from synthetic fabrics like polyester, nylon, acrylic, and polar fleece. When these fabrics are washed, they shed microfibers that flow into wastewater treatment plants, leaving behind 98 and 99 percent of the fibers in sewage sludge. The sewage sludge is then applied to fields as fertilizer, releasing hundreds of thousands of tons of microplastics into the soil each year.

Besides microplastics, sewage sludge contains cadmium, a toxic heavy metal, and PFAS. These components can contaminate cows and dairy products if cows graze where the sludge has been spread. It has also been discovered that plants accumulate 1.5 times more cadmium when microplastics are present than when microplastics are not. Over time, eating or drinking small amounts of cadmium has been linked to kidney disease but could also cause other health issues.


Once in the soil, microplastics can have a variety of adverse effects. One of these effects is poorer soil aggregation. Soil aggregation refers to the soil's arrangement of sand, silt, clay, and organic matter. Aggregate stability is an indication of good soil health. Soil components create the pore network, constituting the soil structure that controls soil processes, including biogeochemical cycles and soil carbon storage and processing.

Microplastics have a huge range of shapes and sizes, some similar to naturally-occurring shapes and sizes while others are not. For example, microplastic fibers (rigid, unbranched, thread-like filaments unlike fungal hyphae or plant roots) negatively affect soil stability. In contrast, microplastic beads can act like sand particles with little or no adverse effects on soil stability. Plastic-contaminated soils can also have drainage problems, with water pooling on or running off the surface instead of soaking in.

## MICROPLASTIC EFFECTS ON HUMANS AND ANIMALS

Microplastics exhibit properties that might have direct damaging effects on ecosystems. For example, microplastic particles may carry disease-causing organisms and act as a vector that transmits diseases into the environment. When plastic particles break up into smaller and smaller pieces, they gain new physical and chemical properties, increasing the risk that they will have a toxic effect on a more significant number of organisms. As it degrades, additives such as phthalates and Bisphenol A (BPA) leach out of the plastic. These chemicals are hormone disruptors and can wreak havoc on vertebrate and invertebrate development, biochemical functions, and other hormone-controlled systems. Nano-sized particles can cross cellular membranes, including the blood-brain barrier and the placenta, and can trigger changes in gene expression and biochemical reactions within the cell. Much more research needs to be done on these changes' full and long-term effects. However, it has been shown that microplastics passing through the blood-brain barrier in fish change their behavior.

Rat and mouse studies – many done in recent years – demonstrate that microplastics can cause deleterious biochemical and structural damage with effects on intestinal, liver, excretory and reproductive systems. Rodents are not humans, but it is safe to say that the presence of microplastics in the human body, whether ingested or inhaled, can be of great concern for human health. Much more research needs to be done.

Every day, humans ingest microplastics in the food we eat, in the water we drink, in the air we breathe. There is no way to get away from it; plastic doesn’t go away, and we humans keep adding more and more of it to the environment. It is everywhere, from the top of the highest mountain to the bottom of the deepest ocean, from the north to the south pole, and has even been found in human placentas and the feces of babies and

adults. Research has shown that the microplastic concentration in babies' feces is ten times higher than in adult feces. Babies fed from a plastic bottle are ingesting millions of plastic particles daily. Combined with the fact that babies and young children are more vulnerable to chemical exposure, it is very worrisome. In other research, microplastics were found in the blood of almost 80% of the healthy adults tested, latching onto the membranes of red blood cells, possibly limiting their ability to carry oxygen. The blood can then carry the particles to all body parts, where the particles can accumulate in organs and other tissues. Of the adult blood samples analyzed, half contained polyethylene terephthalate (PET), the type of plastic commonly used in drink bottles (think bottled water and soft drinks), and one-third contained polystyrene used in food packaging and other products. One-fourth contained polyethylene, the plastic used in grocery bags. Other types of plastic have yet to be tested, but likely, different types of plastic will also be detected in the blood. In further research analyzing previous studies of the toxicological impacts of microplastic on human cell lines, increases in cell death, allergic responses, and damage to cell membranes were found at microplastic levels comparable to those commonly ingested by people regularly. In addition, more significant damage was seen when researchers used non-spherical plastic pieces in their experiments. The actual impact on human health is unknown because of the unethical nature of using human subjects.

The presence of circulating microplastic particles in the body can cause health-related problems, but an even more significant health risk is due to the chemical properties of plastic. We know that the chemical nature of plastic makes it a carrier of bacteria and persistent organic compounds (POPs), which include pesticides and dioxins, among other harmful substances. POPs biomagnify; as they move up through the food chain, the concentrations of the toxic substances and bacteria increase as the size of the plant or animal increases. Professor Dick Vethaak, an ecotoxicologist at Vrije Universiteit Amsterdam in the Netherlands, says, "more detailed research on how micro- and nano-plastics affect the structures and processes of the human body, and whether and how they can transform cells and induce carcinogenesis is urgently needed, particularly in the light of the exponential increase in plastic production. The problem is becoming more urgent with each day."

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# TAKING ACTION

**BUSINESSES:**

- Restaurants use eco-friendly takeout containers and utensils.
- Trigon Plastics (Lebanon County) converts recycled plastics into “poly lumber” and other products.
- Individuals or groups collect plastic film for Trex Company, Inc. and receive free poly lumber benches.
- In Clarion, Advanced Drainage Systems (ADS) uses 40% recycled plastics to make drainage pipes.
- Walmart, Pepsi, and Ikea, to name a few, have committed to using only reusable or recyclable packaging by 2025.

**GOVERNMENT ENTITIES:**

- Thirty years ago, Pennsylvania passed Act 101, requiring municipalities of over 10,000 people to recycle. Today, more than 94% of Pennsylvania residents have access to recycling. And recycling has created over 66,000 jobs!
- Ten states have passed container deposit legislation, popularly called “bottle bills.” These may include bottles, cans, or jars made of glass, metal, or plastic. Prices vary between $.05 and $.10. The European Parliament approved a ban on single-use plastics by 2021. The law also strengthens provisions to ensure companies pay to clean up their pollution.
- The European Parliament approved a ban on single-use plastics by 2021. The law also strengthens provisions to ensure companies pay to clean up their pollution.
- Canada has banned all single-use plastic across the country.

**REDUCING YOUR PLASTIC FOOTPRINT**

This strategy requires some planning. But don’t feel overwhelmed. Start by taking a few steps to get you going, then add more actions as you get into the habit. Soon it will become second nature.

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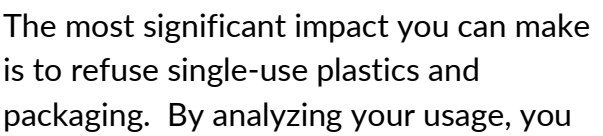

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The most significant impact you can make is to refuse single-use plastics and packaging. By analyzing your usage, you can replace straws, water bottles, and other "disposable" plastic items with plastic-free reusable items.

| **Refuse Single-Use Plastic Products** | **Immediate Action** |
|---|---|
| Plastic bags | Bring your own reusable cloth bags. |
| STOP buying bottled water | Use your own container made of glass or metal. |
| Plastic or plastic-lined hot beverage cups/lids | Carry your own mug made of glass, ceramic or stainless steel. |
| Plastic food containers including Styrofoam | Carry reusable non-plastic (or reused plastic) containers. |
| Plastic plates/utensils | Pack a travel kit with washable/ reusable utensils and plates made of bamboo, stainless steel, or wood. |
| Plastic straws | Refuse straws or carry straws made of paper, bamboo or metal in your travel kit. |
| Plastic packaging | Choose to buy cardboard packaging when available, or no packaging at all. |

## COMMUNITY ENGAGEMENT AND PLASTIC WASTE AUDITS

Recycling is the last of the 3Rs. If you are concerned about this issue, you are not alone. By setting an example (for instance, by using washable dishes and cloth napkins for

parties and avoiding giving plastic gifts), you will have some kindred spirits in your community.

The fact is that less than 10% of all plastics are recycled. By engaging interested friends and neighbors, you can impact the community. Decide on a community project like a plastic audit. This might involve several steps, including:

1. **An audit of familiar sources of plastic pollution in the community** to determine the number of plastic bottles, bags, straws, cups, utensils, and a stream of plastic products and where they might come from. Keep track of numbers so that you can report your results**.**

2. **Evaluate and identify viable, locally sourced alternatives to the sources of the pollution.** With a bit of planning, you can collect valuable information.

3. **Develop a presentation showing your results. Host a screening** of informative documentaries like *Bag It* or *Plastic Paradise* to get people together to discuss the issues and possible alternatives.

4. **Engage the community in recycling efforts and supporting locally sourced alternatives.** You may find help from an existing non-profit organization. . . or create your own "Pollution Solution." Involve your elected officials to pass a local ordinance designed for your community.

## LAWS ADDRESSING SINGLE-USE PLASTICS AS OF JULY 2023

**Local Legislation in Pennsylvania:**
Pennsylvania follows Dillon's Rule, meaning local governments derive their powers from the state. They can only exercise powers that are expressly authorized to them by the state. Some Pennsylvania municipalities, however, have adopted home rule charters. So, if your township is considering working on single-use plastic bag bans, make sure you know what government your township works under.

Single-use plastic bag ordinances exist in Philadelphia and Pittsburgh and townships such as Radnor, West Goshen, Radnor, Easttown, Uwchlan, and Cheltenham. Numerous

townships in Montgomery, Delaware, and Chester Counties are working on single-use plastic bag bans.

If you want to obtain a model ordinance, LWVPA has copies of some of the laws passed in Pennsylvania. Before you work on a single-use plastic bag ban ordinance, Beyond Plastics, LWVPA, and several township environmental advisory committees recommend doing survey work and public education events.

**State Legislation in Pennsylvania:**

**SB144—Restricting PFAS Chemicals from Firefighting Foam—**this legislation does not go far enough. PFAS is only restricted to testing applications. As for actual firefighting, the chemicals used must be on the label. It does not affect the manufacturing of this product. There are alternatives—Fluorine-free foam and dry chemical agents. C6 firefighting foam is listed as an alternative; however, it contains PFAS.

**HB470- Single-use Polystyrene ban**—this is good legislation but imperfect since it would ban polystyrene take-out containers and styrene coffee cups. It continues the conversation about plastic pollution. Some local ordinances already prohibit polystyrene. The state of Oregon has a polystyrene ban.

**HB603 and HB604- Chemicals in our Drinking water**-These bills specifically target PFAS/PFOA in our drinking water supply and hazardous waste sites

**HB1001—Establishment of a Plastic Pollution Task Force—**This would establish a plastic pollution task force within the DEP. It sounds good, but it may not be that helpful since the Department of Environmental Protection has a daunting task already and cannot always do everything it should. Perhaps—more environmental groups should work with the DEP on this.

**HB1122—Keeping Forever Chemicals Out of Our Food**—this legislation would prohibit purchasing PFAS-containing food packaging. This is an urgent matter. Along with the polystyrene ban—this could have an impact on the health of our citizens. For this reason, I urge everyone to contact their legislators and ask that this bill be moved out of the House ERE committee. We can't allow Pennsylvanians to have PFAS in their food.

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## OTHER US LEGISLATION

Three states have laws regarding single-use plastics. In 2016, California became the first state to ban single-use plastic bags from major retailers. In March 2019, New York state banned most single-use plastic bags. New York also allows individual counties to charge an optional paper bag fee. Finally, Hawaii has a *de facto* ban since its most populous counties have passed their own local rules.

## GLOBAL LEGISLATION

According to Christian Science Monitor, at least 127 countries now regulate single-use plastic bags at some level. African nations are currently in the lead. 34 African nations have imposed bans or limits on single-use plastics and bags. Some also ban imports of single-use plastics and plastic waste. On Wednesday, March 2, 2022, 175 nations formally agreed to begin writing a UN plastic treaty to fight plastic waste globally. Negotiators will periodically meet to develop the details of the plastic treaty, and their goal is to finalize the legally-binding agreement by 2024.

## PLASTIC RECYCLING

What could be easier than recycling? There's a convenient bin for your empty water bottle almost everywhere you go. In Pennsylvania, statewide recycling began in 1988 with the enactment of the Municipal Waste Planning Recycling and Waste Reduction Act (Act 101). It was one of the most comprehensive recycling programs enacted by any state then.

Act 101 requires larger municipalities to "implement a source separation and collection program for recyclable materials." It resulted in developing a Recycling Marketplace that has generated $22.6 billion annually for Pennsylvania's economy.

And yet, most single-use plastics end up in landfills. Many municipalities have started "single stream" recycling programs to increase participation. In this system, plastics, metals, glass, and cardboard are mingled and sorted at a local recycling facility.

The plastics are then sent to a Materials Recovery Facility (MRF). Since plastics melt at different temperatures, MRF workers are hired to sort them by type before they are cleaned and made into pellets. The pellets are then melted down and used by manufacturers to make recycled items.

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Extended Producer Responsibility (EPR) is the environmental program that shifts the responsibility for post-consumer waste from taxpayers and municipal governments to the companies that produce the packaging, creating incentives for producers to reduce the amount of packaging they make, increasing packaging recycling rates, providing revenue to improve recycling systems, and reducing carbon and energy use.

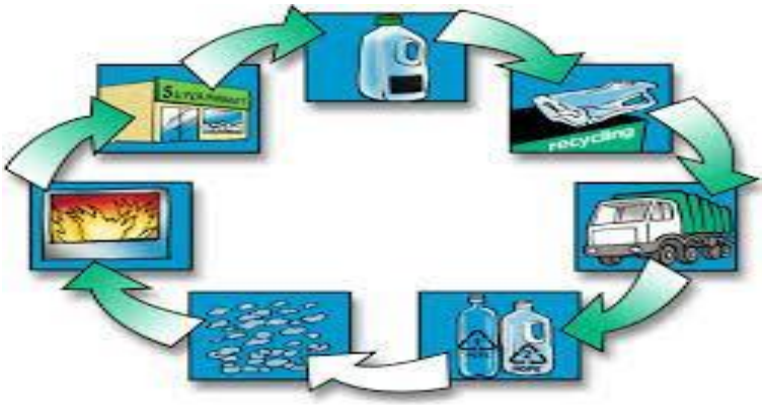


Image Credit: **BareekSudan**

## PLASTIC BY THE NUMBERS

- Around 380 million metric tons of plastic are being produced yearly. 8.3 billion Metric Tons (9.1 billion US tons) of plastic have been produced since plastic was introduced in the 1950s. The amount of plastic made in a year is roughly the same as the entire weight of humanity.
- Humans use about 1.2 million plastic bottles per minute in total. Approximately 91% of plastic is not recycled. Roughly half of our global annual plastic production is destined for a single-use product.
- Virtually every piece of plastic ever made still exists in some shape or form (except the small amount that has been incinerated).
- Americans purchase about 50 billion water bottles annually, averaging about 13 monthly bottles for every person in the U.S.! That means by using a reusable water bottle, you could save an average of 156 plastic bottles annually.
- Five trillion plastic bags are produced worldwide annually. It can take up to 1,000 years for a bag to disintegrate completely. Americans throw away 100 billion bags annually– the equivalent of dumping nearly 12 million barrels of crude oil! By switching to reusable shopping bags, we can eliminate that waste–about 307 bags per person.
- Americans alone use half a billion drinking straws every day.

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- The world uses 500 billion plastic cups every year. The world also produces over 29 million US tons of polystyrene (plastic foam) annually. Americans alone throw away around 25 billion Styrofoam coffee cups every year.
- In 2017, packaging production constituted the highest-demanded use for plastic, with 146 million metric tons used.
- At least 14 million tons of plastic are in our oceans every year. Many countries lack the infrastructure to prevent plastic pollution, such as sanitary landfills; incineration facilities; recycling capacity and circular economy infrastructure; proper management and disposal of waste systems.
- When plastics end up in landfills, they aren't harmless. They break down into tiny toxic particles that contaminate the soil and waterways and enter the food chain when animals and plants accidentally ingest them. Researchers in Germany indicate that terrestrial microplastic pollution is much higher than marine microplastic pollution– estimated at four to 23 times higher, depending on the environment. This could ultimately have adverse health effects on humans and animals.

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Fact Sheet: Single-Use Plastics

An Underestimated Threat: Land-Based Pollution With Microplastics

Plastic Mulching In Agriculture. Trading Short-Term Agronomic Benefits For Long-Term Soil Degradation?

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