Can we kill plastic?

The world produces more and more single-use plastic every year. Here's how you can cut back.

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> This story is part of **Road Trip 2020**, CNET's series on how we're preparing now for what could come next.

I magine a typical morning, when you're making breakfast at home. You might brew a pot of coffee, take out your yogurt, a basket of blueberries and some orange juice, all while reading your newspaper.

How many times did you just touch plastic?

The bag holding your coffee grounds. The containers for your yogurt, orange juice and blueberries. The sleeve your newspaper was delivered in. All are likely single-use items you won't touch again.

In 2018, the world produced 359 million tons (https://www.plasticseurope.org/application/files/9715/7129/9584/FINAL_web_version_Plastics_the_fa of plastic, 357 million tons more than produced in 1950. Most of it is single-use

packaging (https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data) for food, beverages and goods, which we typically discard as soon as we finish that last blueberry. And we just keep using more of it.

The rapid increase in plastic production has potentially dire consequences for not just the environment, the oceans and the animal population. Take the Great Pacific Garbage Patch (https://www.cnet.com/news/plastic-is-ruining-the-oceans-but-there-are-ways-you-can-help/), a mass of trash spread across 1.6 million square kilometers of the Pacific Ocean with more than a trillion pieces of tiny fragments called microplastics. When fish ingest microplastics (https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.14020), it changes their brain and behavior (https://www.nature.com/articles/s41598-017-10813-0). And it's not only sea life that's at risk. Just by eating, drinking and breathing, the average American ingests at least 74,000 microplastic particles each year, a 2019 research review (https://pubs.acs.org/doi/10.1021/acs.est.9b01517) found. Even if discarded plastic ends up in a landfill, it can last here for up to 600 years (https://www.whoi.edu/fileserver.do?id=107364&pt=2&p=88817).

It doesn't go away, it just piles on. And with the coronavirus pandemic changing consumer consumption habits -- more takeout, more online ordering in boxes -- 2020 certainly won't be the year that we cut down on single-use plastic.

"Basically everywhere we look now, we find plastic," said Jenna Jambeck, a professor at the University of Georgia's College of Engineering who researches plastic waste. "It's all around us, and we know it's in the air and in different food products. But we don't really know yet what the impacts are on human health."

But here's the thing about plastic: We'll probably never be able to stop producing it. And that's OK: Plastic has many excellent uses. But continuing to make more and more each year is unsustainable. Which means one thing: We need to bend the curve on single-use plastic production. Companies like McDonalds, Coca-Cola and SodaStream have made pledges to reduce plastic use in the coming years, but real change in terms of improved reuse and recycling will take a concerted effort among lawmakers, corporations and average people changing their habits.

"You can't just leave it up to households -- they have no chance," said Roland Geyer, a professor at the Bren School of Environmental Science and Management at the University of California at Santa Barbara. "The plastic producers should share a significant part of the responsibility. At this point I don't see that happening without policy intervention."

But there are ways that we as individuals can combat the negative effects of plastic in our everyday lives, even if we can never kill it completely.

Single-use plastic like bottles often end up in the ocean or the environment, and has a negative impact on animal and human life.
Getty/Barcroft Media/Contributor

The rise of plastic

Of course, humankind didn't make its way through years of evolution clutching a to-go coffee cup. The first fully synthetic, mass-produced plastic was invented in 1907 (https://www.plasticseurope.org/en/about-plastics/what-are-plastics/history). But the meteoric rise of single-use plastic began in the years immediately after World War II, when factories were converted from military to consumer production. In the 1950s, new materials including polyethylene and polypropylene made it possible to create new plastic shapes for less money. As consumers in developed countries like the US were becoming wealthier, households could afford to purchase single-use products like disposable diapers, pens and razors.

Geyer says that most packaging was reusable before it was single use, often made of glass or aluminum. "We just got used to single-use packaging," he says. "I'm pretty sure our grandparents would all be appalled."

The world's production of virgin (newly produced) plastic has grown by about 4% a year since 2000, as we use more and more of it in our daily lives, Geyer's research found. If we continue on the same path, by 2030, our plastic production is expected to double, leading to more trouble for overflowing landfills and oceans -- and to increased use of petrochemicals required to manufacture it. And that contributes to a rise in carbon emissions.

A familiar US grocery store scene, where almost everything is wrapped in a single-use plastic container that will get thrown out quickly.
Getty/Kike Calvo/Contributor

Plastic production is also unevenly spread around the world. As of 2018, 51% of new plastic was produced in Asia, 18% in North America and 17% in Europe, according to research (https://www.plasticseurope.org/application/files/1115/7236/4388/FINAL_web_version_Plastics_the_fa from PlasticsEurope, an association that represents European plastics manufacturers. The real impact comes in plastic pollution: In Asia (https://www.reuters.com/article/us-asia-plastic/southeast-asian-countries-need-tougher-plastic-policies-to-curb-pollution-u-n-idUSKBN1XN1QL#:~:text=Southeast%20Asia%20is%20a%20major,China%2C%20the%20top%20single demand for plastic consumer products is high, but according to a 2019 UN report, (https://www.developmentaid.org/api/frontend/cms/file/2019/11/FINAL_THE-ROLE-OF-PACKAGING-REGULATIONS-AND-STANDARDS-IN-DRIVING-THE-CIRCULAR-ECONOMY.pdf) poor waste management practices have led the area to be the top contributor of plastic waste into the world's oceans.

"South-East Asia is a primary source and victim of plastic, where it is choking seas and threatening ecosystems and livelihoods," said Kakuko Nagatani-Yoshida, the UN Environment Programme's Regional Coordinator for Chemicals and Waste, when the report was released (https://www.unenvironment.org/news-

and-stories/press-release/unep-report-warns-plastic-policies-lagging-behind-south-east-asia). "If we want to solve the marine litter problem globally, we have to solve it in this region."

Unfortunately, there's been little change at the government level for these regions since then, and the pandemic is only making the problem worse (https://asia.nikkei.com/Spotlight/Environment/Plastics-pile-up-as-coronavirus-hits-Asia-recyclers), with more plastic being output and lockdowns interrupting recycling practices.

The problem with recycling

For years, government campaigns and environmental activism have encouraged us to recycle. But while recycling may feel like the responsible thing to do, it's not widespread across the world. And recycling has its own problems. When you look at what's happened to all plastic made over time, the numbers aren't encouraging: As of 2015, only 9% of all plastic ever made had been recycled, 12% was incinerated and 79% was in landfills or the environment, according to research (https://advances.sciencemag.org/content/3/7/e1700782.full) from Geyer and others.

Robert Rodriguez/CNET

In 2017, only about 8% (https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data) of the plastic produced in the US was recycled. Global recycling averages are closer to 15% to 20% today, Geyer said, but it's difficult to quantify how effective recycling programs actually are. While producing a plastic bottle from recycled materials uses less energy (https://portal.ct.gov/DEEP/Reduce-Reuse-Recycle/Municipal-Recycling-Resource-Center/As-A-Matter-of-Fact) than making one from scratch, that bottle made from recycled plastic costs more and is usually of poorer quality.

"Nothing is designed for recycling -- it's all an afterthought," he said. "We get a material that costs more to produce than it's worth on the market. Virgin plastic is just dirt cheap to make."

Ultimately, the point of reusing and recycling plastic is to cut down on the production of new plastic. If you're recycling your plastic water bottles and buying another case, you're not actually helping solve the problem.

Piles of plastic and aluminum at the Green Waste Material Recovery Facility in San Jose, California. Even if we recycle our plastic products, we still need to cut down on the creation of new plastic to really make a difference. Getty/MediaNews Group/The Mercury News

Plus, recycling requires sufficient collection and machinery resources.

"Not every country has resources to create a sustainable recycling system," said Tobias Haider, a research associate at PlastX, an organization based at the Institute for Social-Ecological Research in Frankfurt, Germany, that explores the

role of plastics in our society and their impacts on the environment. "If you don't have that, you also don't have the resources to tackle the waste problem itself."

Compounding the problem is where a country's recycling goes. The United States sends much of its scrap plastic and cardboard overseas with China. But in 2018, China stopped taking in (https://www.cbsnews.com/news/recycling-after-chinas-plastic-ban-american-cities-face-recycling-crisis/) most American scrap materials, leaving some US cities to pay more for their recycling programs or end them altogether, and further increasing the burden on other Asian countries.

A circular system

Even if you try to replace plastics with another material, like paper, there's still an ecological impact: You'd just be throwing away a paper bag after a few hours, instead of a plastic one.

"The sustainable answer would be to create a circular system which reuses the items as much as possible," Haider said. "Plastic products would not be a problem if we reused them." For example, you can reuse plastic grocery bags far more times than paper bags because they're more durable.

But the coronavirus pandemic has complicated some efforts to reduce plastic consumption. While eight states including California and New York had banned single-use plastic bags (https://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx), they've made a return (https://www.nytimes.com/2020/04/24/us/california-plastic-bag-ban-coronavirus.html) as localities have relaxed their bans and some grocery stores have prohibited the use of customer-owned reusable bags to keep employees healthy.

Efforts to support local restaurants (https://www.cnet.com/how-to/how-to-make-sure-youre-truly-supporting-your-local-restaurants/) by ordering takeout created more increases in single-use plastic cups, plates and food containers (https://sacramento.cbslocal.com/2020/05/17/take-out-containers-taking-a-toll-with-everyone-ordering-out/), as well. And buying more products online (https://www.electran.org/publication/transactiontrends/report-online-ordering-up-among-covid-19-pandemic/) to avoid in-store shopping means more bubble wrap and plastic packaging. Despite using more plastic during this time, some cities temporarily halted (https://resource-recycling.com/recycling/2020/03/17/coronavirus-pandemic-disrupts-recycling-sector/) recycling services to comply with social distancing recommendations and enforce new safety processes.

To move the needle, the US would have to completely change its systems for takeout food and drinks, while still making them convenient for customers to access each day -- no easy task on its own, let alone during a pandemic.

This might look something like making reusable RFID-embedded cups, that you can scan at your coffee shop and get an automatic refill, Jambeck said. Or maybe coffee shops and restaurants turn to tracking reusable cups with chips so you can drop them off and they get washed and reused.

Theme parks like Disney World are already using an RFID cup system for soda refills. And a Chilean startup called Algramo (https://algramo.com/en/home/) has customers bring reusable plastic bottles with RFID tags to a travelling vending machine that moves around the city of Santiago offering refills on detergent and dish soap (https://www.fastcompany.com/90416401/this-startup-is-ditching-plastic-waste-by-bringing-the-refills-to-you). When you bring your bottle back, you get a discount. The company now has refill stations in grocery stores as well, and plans to expand to the US later this year, pending COVID-19 restrictions.

"There are lots of really cool ways to think about changing our systems quite far upstream, using technology," Jambeck said.

Chad Moore/CNET

Benefits of single use

Despite the large amount of waste it creates, plastic isn't totally evil -- even some single-use items are beneficial. For example, in health care, single-use plastic syringes and transfusion bags make the most sense. And during the coronavirus pandemic, we've needed sterile plastic medical products that can be produced quickly. Using other materials would be very difficult, Haider said.

We also save vast amounts of fuel (up to 40% (http://www-g.eng.cam.ac.uk/impee/topics/RecyclePlastics/files/Recycling%20Plastic%20v3%20PDF.pdf), one study found) by transporting products in light plastic packaging than we would transporting them in heavier glass, and that in and of itself has an environmental impact.

Plastic can even be sustainable. It just comes down to how durable the item is. There's a big difference between a lawn chair, a piece of medical equipment or the pipes in your home that last for years versus, say, the wrapping on a bag of chips, which reaches its end of life almost immediately.

Chad Moore/CNET

"It's sort of a miraculous material," Geyer said. "The combination of its material and technical properties combined with the extremely low cost of production makes it kind of irresistible."

We can also make new plastic production more sustainable (https://www.rsc.org/globalassets/22-new-perspectives/sustainability/progressive-plastics/c19_tl_sustainability_cs3_whitepaper_a4_web_final.pdf), though it would require better recycling processes and major investments. One way to do that would be creating polymers out of recycled and reused chemical raw materials that are designed to break down and be recycled, instead of petrochemicals.

Another option is moving to bioplastics, or plastics created from plants or other biological materials (think vegetable fats and oils, corn starch, straw and recycled food waste) instead of petroleum. You may have come across bioplastics in the form of compostable plates and utensils. But things can get complicated when it comes to biodegradability and recycling (https://www.nationalgeographic.com/environment/2018/11/are-bioplastics-made-from-plants-better-for-environment-ocean-plastic/) bioplastic products. For example, they need high heats to break down, so if they enter oceans, they'll behave similarly to other plastics, breaking into smaller pieces that float around for decades.

What you can do to reduce and reuse

Though companies may pledge to reduce amounts of plastic and waste, results often don't pan out. Actual changes will likely require legislative action and incentives, Haider said.

Right now, virgin plastic is just less expensive to produce than recycled plastic, so there's no real motivation to change practices. But if, for example, you had to pay a higher tax on virgin plastic than on more sustainable packaging, that might encourage companies to finally make the switch.

In the meantime, you can ask yourself what changes you can make in your daily life to reduce single-use plastic. But be thoughtful about it. It is not all about replacing plastic items itself, but about a general reduced consumption of single-use items no matter if they are made of plastic, paper or other materials.

For example, you might have heard that buying a wooden toothbrush is better than buying a plastic toothbrush. But if you're throwing it away in the trash after you're done with it, it will end up being burned or in a landfill anyway. It doesn't matter if it's plastic or wood, because it's not ending up in nature, Haider said.

The best approach? Reuse as much as you can. Go for the most stable item that will last the longest, Haider said.

Collectively, consumer choices do have an impact. But it's difficult to make choices when you're in a system that operates with single-use plastic as the norm, Jambeck said. If you find that it's very difficult to make sustainable choices, reflect on that and go from there. Why is it so difficult to buy crackers that aren't wrapped in plastic? Can you get in touch with a brand or a government official?

"If you really want change, you have to make your voice heard," Jambeck said. "But it absolutely cannot just rest on the citizens and consumers. Industries, companies and governments need to be involved as well."

You also don't have to try to immediately eliminate all single-use plastic in your life -- it's too overwhelming, Jambeck said. So go easy on yourself.

"If you slide back and forget to bring your bottle out and buy a drink, that's OK," Jambeck said. "Be forgiving with yourself and don't give up just because you missed one time. Just remember it next time. And know that all the other times

you did remember really have made an impact."
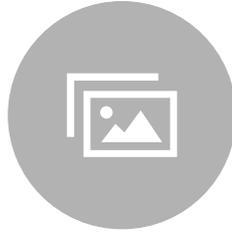
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