

# Plastics, waste and recycling: It's not just a packaging problem

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Discussions of the growing plastic waste problem often focus on reducing the volume of single-use plastic packaging items such as bags, bottles, tubs and films.

But a new University of Michigan study shows that two-thirds of the plastic put into use in the United States in 2017 was used for other purposes, including electronics, furniture and home furnishings, building construction, automobiles and various consumer products.

"Managing plastics has become a grand and complex environmental challenge, and [plastic packaging](#) clearly warrants current efforts on reductions and coordinated material recovery and recycling," said Gregory Keoleian, senior author of a paper published Aug. 25 in the journal *Environmental Research Letters*.

"However, while packaging was the largest defined-use market for U.S. plastics in 2017, our study shows that two-thirds of the plastic put into use that year went into other markets," said Keoleian, director of the Center for Sustainable Systems at the U-M School for Environment and Sustainability. "Those other sectors introduce unique challenges, as well as opportunities, as we attempt a fundamental shift away from the largely linear flow of plastics and toward a circular economy for plastics."

The authors of the new study say it's the first comprehensive characterization of plastics use across the entire U.S. economy. The study concludes that the overall recycling rate for plastics in the U.S is slightly lower than previous estimates: Just 8% of the plastics that reached the end of their useful life in 2017 were recycled.

Previous estimates, including one from the Environmental Protection Agency, focused on solid plastic waste in municipal landfills, composed largely of containers and packaging. The new study also includes plastic from construction and demolition waste and from automobile shredder residue.

When those sources were added, the 2017 recycling rate for U.S. plastics

dropped even lower than the EPA's 8.4% estimate. Both studies found that about 76% of the plastics that reached end of life in 2017 were buried in landfills.

The new study, known as a material flow characterization, details a single year of plastics production, use and disposal in the U.S and uses the best available data from industry and public sources. The goal was to generate a road map to help guide industry, policymakers and academics along the path toward accelerated plastic waste reduction.

Specifically, the information is expected to be of interest to material scientists and engineers, resin producers, product and packaging designers and manufacturers, retailers, material recovery innovators and operators, and solutions-oriented academics, research institutions and policymakers.

"We created a detailed map of the plastics flows—from production through use and waste management—and we tracked plastics by type and markets," Keoleian said. "We characterized the scale of the problem through this broader lens to prioritize solutions that will have impact."

The study also found that:

- An estimated 2% of end-of-life North American plastics ended up in the natural environment in 2017. "Leakage" of plastics into the environment is now a major concern due to the persistence and potential impacts of plastics on organisms and ecosystems.
- The amount of plastic in use across the U.S. in 2017 was about 400 metric tons, an amount eight times greater than the quantity of plastics manufactured that year.
- While an estimated 8% of plastics disposed in the U.S. in 2017 were recycled, inefficiencies in sorting and reprocessing likely mean that an even smaller percentage returned as feedstock for

new products.

Plastics, formally known as synthetic organic polymers, are ubiquitous in today's society. These versatile materials are inexpensive, lightweight, strong, durable and corrosion-resistant, with valuable thermal and electrical-insulation properties.

But most common plastics do not biodegrade and their accumulation in, and contamination of, natural environments is an ever-increasing concern.

In addition, the vast majority of plastics are derived from fossil fuels; global production of plastics currently represents about 8% of global annual oil and gas consumption. Emissions associated with the 407 metric tons of conventional plastics produced globally in 2015 correspond to 3.8% of global greenhouse gas emissions that year.

"Unmoderated production of [plastic](#) products has resulted in unacceptable accumulation of debris in landfills and in natural environments, representing a gross waste of resources and disruptions to wildlife and ecosystem function," the authors of the *Environmental Research Letters* paper wrote.

"Solutions to these rising problems will come in a myriad of forms, but there is widespread agreement that greatly improved coordination between product design and end of life is necessary."

**More information:** Martin C Heller et al. Plastics in the US: toward a material flow characterization of production, markets and end of life, *Environmental Research Letters* (2020). [DOI: 10.1088/1748-9326/ab9e1e](https://doi.org/10.1088/1748-9326/ab9e1e)

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