Featured Business & Policy Home & Garden

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The Greenhouse Gas Emissions of Recycling

By Gemma Alexander

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Despite our best intentions, everything we do has some environmental impact. Even though true sustainability may be out of reach, environmentalism is about making trade-offs to minimize the harm that comes from our actions. Since our world is made up of complex systems, it isn't always easy to figure out which choices have the best environmental outcomes. Sometimes, choice that seems more obviously sustainable isn't actually the greenest or doesn't make as much difference as you'd expect. Take, for example, one recent study of the greenhouse gas emissions created by recycling.

Recycling

Recycling was one of the first environmental choices to go mainstream. There are **a lot of things** you can do that have a bigger impact on your **carbon footprint**. But to this day, recycling is still the first thing most people think of when they think about saving the planet.

A lot of factors go into designing a municipal **curbside recycling system** – things like **worker safety**, ease of participation for residents, strategies for minimizing **contamination**, what kind of processing facilities are available and how much they cost to operate, **market demand** for the recyclables and for the recycled materials they will produce. And depending on these factors, communities can choose from several different recycling systems.

In the beginning, all recycling was source separated. That means every material required its own bin, and even different colors of glass had to be separated. In the 1990s, the advent of **materials recovery facilities** (MRFs) enabled commingled, or single-stream, recycling where everything was collected in one bin. What comprises "everything" varies among communities and may exclude plastics and/or glass. More recently, many communities have begun **composting organic waste**, which necessitates a separate bin for the collection of food and yard waste.

Many communities now offer composting services in addition to single-stream recycling.

Life Cycle Analysis of Recycling Systems

Because recycling is widely assumed to be a universal good, few people have looked closely at the environmental impacts it produces. But a recent **life cycle analysis** by the Environmental Research & Education Foundation (EREF) compared greenhouse gas emissions and fossil fuel energy use among landfilling, recycling, and composting to find out

whether using a recycled material is always better than using a virgin material. And **the answer** was more complicated than you might expect.

For the study, EREF looked at four scenarios:

- All-landfill (one bin)
- Curbside single-stream recycling (two bins: garbage and recycling)
- Curbside single-stream and yard waste composting (three bins: garbage, recycling, yard waste)
- Curbside single-stream and combined yard/food waste composting (three bins: garbage, recycling, organics)

Unsurprisingly, recycling does emit fewer greenhouse gases than landfilling. But the difference wasn't always very significant.

- A simple two-bin, single-stream system had the best results with a 38% reduction in emissions compared to landfilling everything.
- A three-bin system combining food and yard waste only reduced emissions by 10%.
- Emissions from three-bin systems that only accept yard waste were roughly equivalent to the landfill.

The study attributed the efficiency loss for three-bin systems to additional fossil fuels used for curbside collection of a third bin. Managing the compost piles (especially for pile aeration) also added to the emissions of three-bin systems. Presumably, combined food and yard waste outperformed yard waste-only systems because food waste contributes a lot to **landfill emissions** while it improves the nutrient balance in a compost pile. The addition of food waste may also contribute to efficiencies of scale of commercial composting systems.

Make sure you know the local recycling rules and put only materials your service accepts into your recycling bin.

What Should You Do?

Regardless of how your curbside recycling system is structured, it's still a good idea to participate. In most cases, you will be saving at least some greenhouse gas emissions. Even without reducing greenhouse gas emissions, all scenarios resulted in energy savings compared to just landfilling. They also noted the significant environmental benefits of composting that their analysis does not capture.

But you can try to recycle better. MRFs that process the materials must discard **contaminated recyclables** — an additional step that lowers the overall efficiency of the operation. Make sure you understand which materials your local recycling service accepts. Avoid "**wishcycling**" and remove non-recyclable lids and **labels** from containers before you put your recyclable items in the recycle bin.

You can also communicate with your local utility and elected officials to advocate for a greener system. Inform them of the results of this study. And let them know that the distance from collection to processing can reduce the environmental benefit of their program. According to the study, plastics and metals can be transported thousands of miles without negating the emissions benefits of recycling them. But transporting glass 1,150 miles and transporting fiber (paper and cardboard) 360 miles negates their emissions savings from recycling. **Investing in the green economy** by establishing processing facilities closer to the source can protect the environment and create local jobs.

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Gemma Alexander has an M.S. in urban horticulture and a backyard filled with native plants. After working in a genetics laboratory and at a landfill, she now writes about the environment, the arts and family. See more of her