

Researchers:

# Use of Plastics = Helping Combat Climate Change

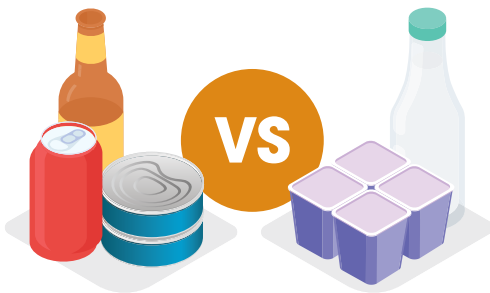
Based on decades of life cycle analyses (LCAs) that study the environmental impacts of consumer goods, multiple researchers have concluded:

- The use of plastic packaging and products can significantly reduce greenhouse gas emissions compared to alternatives such as steel, paper, aluminum, glass, etc.
- Replacing plastics with alternatives in many applications would significantly increase greenhouse gas emissions.



**Use of plastic packaging and products can significantly reduce greenhouse gas emissions.**

## Plastics = Less Material for the Same Function



LCA studies typically find that use of plastics in consumer products and packaging can significantly **reduce greenhouse gas emissions** compared to alternatives primarily because strong yet lightweight plastics require much less material to perform similar functions. (This often is called “source reduction.”) Multiple researchers note that **plastics use less material and weigh less:**

“(The environmental cost of alternatives to plastics is) greater in aggregate due to the larger quantities of material needed to fulfill the same purpose.”<sup>1</sup>

*Trucost, 2016*

“(One of the) main factors influencing differences in results for plastics and alternative packaging types (is) ... less weight of plastic packaging required to perform same packaging function.”<sup>2</sup>

*Franklin Associates, 2018*

“Plastic packaging usually provide(s) the same function with significantly less material mass per functional unit. In most cases this leads to less production energy and GHG (greenhouse gas) emissions per functional unit than for the mix of alternative materials.”<sup>3</sup> *Denkstatt, 2011*

## Higher Strength-to-Weight Ratio More Efficient

Put another way, because plastics are strong yet lightweight, they generally allow us to fulfill more needs with less material, which can **reduce greenhouse gas emissions** compared to alternatives. This beneficial “strength-to-weight” ratio means that plastic materials used in packaging and products are typically considered more efficient than alternative materials.



**How much more efficient?**

“On average

**OVER 4X MORE**

alternative material is needed (by weight) to perform the same function.”<sup>4</sup>

*Trucost, 2016*

## More Efficient More Productivity per Pound

Plastic packaging is a good example to illustrate the efficiency or strength-to-weight ratio benefits of plastics. Lightweight plastic packaging typically delivers more food or drink per pound and per unit than alternatives.

Lightweight plastic packaging typically delivers more food or drink per pound and per unit than alternatives. For example, plastics are used to package more than 50% of typical consumer goods but make up only 17% of all packaging by weight. In other words: more productivity for fewer pounds of material.

## More Productivity per Pound Reduced Greenhouse Gas Emissions

In addition to packaging, LCA studies find similar efficiencies in common plastic products. These efficiencies (output per pound) typically result in **reduced greenhouse gas emissions**. How much less? While studies vary somewhat, research typically shows that use of plastic packaging and products result in approximately **2.5 times less greenhouse gas emissions** than alternatives.



### If Other Materials Were Substituted For Plastics

GHG emissions for packaging would increase by a

factor of  
**2.7<sup>5</sup>**

*Denkstatt, 2011*

For the entire packaging sector, life cycle global warming potential would be

**2.2x<sup>6</sup>**  
higher

*Franklin Associates, 2018*

Plastic products = 565 Mt of CO<sub>2</sub>e<sup>7</sup> and alternatives = 1,446 Mt CO<sub>2</sub>e<sup>8</sup>

**2.5x**  
more CO<sub>2</sub>e

*Trucost, 2016*

To put these differences in greenhouse gas emissions in perspective, using only bottles as an example:

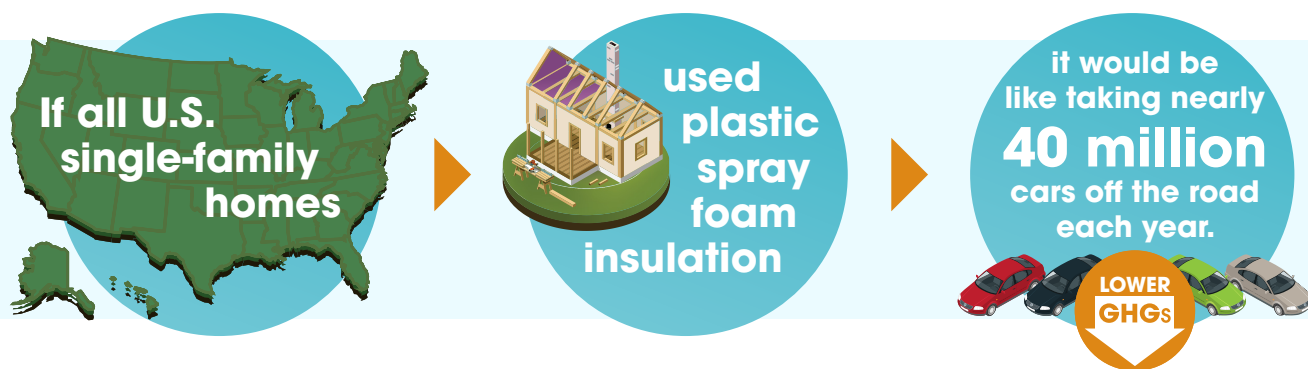
“If all plastic bottles used globally were made from glass instead, the additional carbon emissions would be equivalent to powering around 22 large coal-fired power plants. This is equivalent to the electricity consumed by a third of the UK.”<sup>9</sup> Just for bottles. *Imperial College of London, 2020*

## More Energy-Efficient Homes Reduced Greenhouse Gas Emissions

In addition to their efficiency, the performance of plastics in our homes and buildings can also lead to **reduced greenhouse gas emissions**. Among other benefits, plastic building materials can improve insulation performance (R-value) and limit unwanted airflow, contributing significantly to energy efficiency in homes and buildings, which **reduces greenhouse gas emissions**.

For example, a 2021 study found that if all U.S. single-family homes used plastic spray foam insulation, the **reduction in greenhouse gas emissions** would be equivalent to taking nearly 40 million cars off the road each year.<sup>10</sup> *Sustainable Solutions Corporation, 2021*<sup>11</sup> *Spray Polyurethane Foam Alliance*

This use of spray foam insulation also would also **reduce greenhouse gas emissions** related to home heating/cooling by a whopping 40%.<sup>12</sup> *Spray Foam Coalition*



## More Fuel-Efficient Cars Reduced Greenhouse Gas Emissions

If you replaced the plastic in vehicles with other materials it would increase the weight by

**230%**



Carmakers are increasing use of durable, lightweight plastics to decrease the weight of car parts, which improves fuel economy and **cuts greenhouse gas emissions**. Today's cars are made of approximately 50% plastics by volume but only 10% by weight.

"A 10% reduction in vehicle weight can result in a 6%-8% fuel economy improvement." U.S. Department of Energy,<sup>13</sup> *Vehicle Technologies Office*

Replacing plastics in passenger vehicles with alternative materials (e.g., various metals) would increase weight by 230% and increase fuel consumption in North America alone by 89 million gallons over vehicle lifetimes (2015 data).

"The greatest environmental cost (would arise) from greenhouse gas emissions."<sup>14</sup> *Trucost, 2016*

## Key Overall Findings

In short, LCA studies typically find that use of strong yet lightweight plastic packaging and products can significantly **reduce greenhouse gas emissions** compared to alternatives, primarily because plastics require much less material to perform similar functions. Similar benefits are found in our homes and cars where plastics can help decrease energy and fuel use, which **reduces greenhouse gas emissions**.

### Plastics Are Helping Combat Climate Change

Due to reduced greenhouse gas emissions compared to alternatives such as steel, tin, paper, aluminum, glass, etc., over their life cycles, plastic products and packaging are playing a key role in **lowering our carbon footprint** and **are helping combat climate change**.

Plastics



2.5X  
LESS GHGs  
APPROXIMATELY

than alternative  
materials

1. [\*Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement\*](#), Trucost, 2016
2. [\*Life Cycle Impacts of Plastic Packaging Compared to Substitutes in the United States and Canada \(Theoretical Substitution Analysis\)\*](#), Franklin Associates, A Division of Eastern Research Group (ERG), 2018
3. [\*The impact of plastic packaging on life cycle energy consumption and greenhouse gas emissions in Europe\*](#), Denkstatt, 2011
4. [\*Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement\*](#), Trucost, 2016
5. [\*The impact of plastic packaging on life cycle energy consumption and greenhouse gas emissions in Europe\*](#), Denkstatt, 2011
6. [\*Life Cycle Impacts of Plastic Packaging Compared to Substitutes in the United States and Canada \(Theoretical Substitution Analysis\)\*](#), Franklin Associates, A Division of Eastern Research Group (ERG), 2018
7. *Carbon dioxide equivalent: the net global warming potential relative to carbon dioxide (CO2). For example, since methane has a higher global warming potential than CO2, each pound of methane released makes a larger contribution to global warming impacts than a pound of CO2.*
8. [\*Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement\*](#), Trucost, 2016
9. [\*Examining Material Evidence: The Carbon Footprint\*](#), Imperial College of London, 2020
10. [\*SPF Residential Energy Modeling Analysis\*](#), Sustainable Solutions Corporations, 2021
11. <https://blog.americanchemistry.com/2021/03/spray-foam-helps-protect-whats-inside-as-well-as-whats-outside/>
12. [\*Spray Foam Helps Protect What's Inside as Well as What's Outside\*](#)
13. [\*Spray foam: contributing to sustainability and reducing greenhouse gas emissions from buildings\*](#)
14. [\*Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement\*](#), Trucost, 2016

America's Plastic Makers also are focused on tackling greenhouse gas emissions from our production and are engaged in an all-of-the-above strategy to dramatically reduce or eliminate our carbon footprint. More information: [plasticmakers.org](https://plasticmakers.org).