



A Product-Level GHG Accounting Approach to Increase Emissions Transparency in the Plastic Supply Chain

Product-Level Data Enables Purchasers to Push for Emissions Reductions

Corporations and governments are signaling their intention to purchase key commodities produced with lower emissions. Emissions data at the product level, where purchasing decisions are made, is key to fulfilling this goal. Further, it is critical to ensure that product-level emissions reporting **is comparable based on primary data**, and that it provides sufficient information such that purchasing decisions can drive real emissions reductions.

Preconsumer (i.e., Virgin Resin) and Postconsumer Recycled Plastic Differentiation Facilitates Decarbonization Decisions

Plastics are a critical commodity in modern society. A wide array of end-use applications contributes to plastics demand, which is projected to grow 50% by 2050, driven by demands from the rising global middle class. Most plastic is used for applications in packaging, buildings/construction, textiles, bags/films, automotive, appliances/electronics, medical applications, and other household goods. Plastic production, fabrication, use, and end-of-life disposal generate ~2% of global emissions.

While most plastics consumed are virgin materials (i.e., not previously fabricated), plastic resins from recycled sources are increasingly available. Virgin (primary) plastic production requires substantial amounts of fossil fuels for upstream hydrocarbon collection, processing, and monomer production. In contrast, plastics recovered from the postconsumer waste stream (secondary) require less energy and have lower emissions, since the extraction, processing, and in some cases monomer conversion steps have already occurred.

	Virgin plastic (fossil-based)	Postconsumer plastic (pyrolysis recovered)	Postconsumer plastic (mechanically recovered)
Polypropylene average EU resin GHG intensity	2.0 tCO ₂ e/t resin	2.3tCO ₂ e/t resin*	1.3 tCO ₂ e/t resin*
Share of total polypropylene emissions	95%	~0%	5%
Share of current production / production by 2050	84% / 58%	~0% / 22%	16% / 20%

*Cut-off method ignoring transportation and incineration credits

Currently, around 10% of global plastics are recovered from postconsumer waste streams. Because of the lower energy demand and emissions intensity of mechanically recovered plastics, increasing the share that is mechanically recovered from the postconsumer waste stream is a fast and effective way to reduce the sector’s emissions in the near term. However, the supply of postconsumer plastic is constrained by consumer behavior, collection programs, recovery infrastructure, and the elevated level of contamination present in some recycled streams.

Projections from the International Energy Agency (IEA) suggest postconsumer plastic will meet less than half of overall plastic demand in 2050. As a result, decarbonization of plastic production will require technological improvements and associated emissions reductions in virgin resin production processes (e.g., use of renewable power, electric furnace heating for monomer production, ambient-temperature separations, and manufacturing unit redesigns).

Market Signals for Demand Toward Decarbonization and Product-Level Emissions Accounting

Increasingly, plastic consumers are demanding decarbonized plastic products, especially those from lower-emissions postconsumer sources. To increase the availability of these lower-emissions postconsumer plastics, stakeholders across the plastics supply chain are forming coalitions to increase the recovery of postconsumer plastics from the waste stream. Additionally, plastics producers are **piloting** low-emissions technologies for virgin plastic production and planning their deployment at a commercial scale. Examples of such activities include a switch to renewable power and the multiple manufacturer **collaborations** that are advancing electrified steam cracking furnace technology.

Considering the above efforts on plastics with reduced emissions, the industry needs a consistent measure of the emissions associated with various processes to manufacture plastics.

Plastic Producers Can Capitalize on This Momentum to Differentiate Their Products

To realize the full benefit of market demand for low-carbon plastic, virgin and postconsumer resin suppliers should provide the emissions intensity of their products separately (in addition to the overall emissions and recycled content) to differentiate these products in the marketplace. This would demonstrate decarbonization efforts in plastics and provide investors, end-users, and other stakeholders with clear avenues toward utilizing lower-emissions raw materials in their downstream products. This additional transparency would demonstrate how producers act on key decarbonization levers.

Stakeholders can jointly accelerate decarbonization through one of the following levers from **IEA's World Energy Outlook 2021**:

- 1. Plastic recycling:** The plastics industry, in conjunction with others in the supply chain such as fabricators and end-users (i.e., industrial or consumer packaged goods suppliers) can support further expansion of plastic collection and recycling efforts. This will increase supply of postconsumer recycled materials, which has been the consistent bottleneck in raising plastic recycling rates.
- 2. Innovative processes:** Modern technologies can reduce manufacturing waste and/or fossil fuel combustion as a share of energy inputs relative to current processes. Such technologies might include furnace electrification, use of renewable feedstocks, and electrochemistry. Innovators can realize consumer-level differentiation benefits for products with lower emissions.
- 3. Renewable electrification:** Investments in and switching to renewable power for manufacturing can quickly differentiate the resulting plastic product by impacting the reporting of preconsumer supply chain segment emissions. Existing polymer production and product conversion segments can increase their cleaner postconsumer recycled resin use to further reduce all plastic product emissions.

RMI's Plastic Emissions Reporting Guidance Supports Product-Level Reporting

RMI's new Plastic Emissions Reporting Guidance provides the framework and methodologies to support plastic supply chain actors in reporting product-level emissions for virgin and postconsumer plastic production processes. Using RMI's guidance, plastic producers and recyclers can clearly demonstrate emissions reductions, thus allowing purchasers to actively contribute to the decarbonization of this critical sector.

Please contact **Joe Fallurin** at jfallurin@rmi.org for more information about the new guidance.