MORE RECYCLING

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Prepared by More Recycling for the American Chemistry Council

2017 National Post-Consumer Plastic Bag & Film Recycling Report

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This 2017 National Post-consumer Plastic Bag and Film Recycling Report is the 13th annual report on the pounds of post-consumer[1] plastic bags and film recovered[2] in the United States (U.S.) for recycling. This research was conducted, and the report was finalized by More Recycling (MORE) for the Plastics Division of the American Chemistry Council (ACC). Throughout this report, plastic bags, wrap and film are generally referred to as "film," which is defined as thin, flexible sheets of plastic. The majority of plastic films are made from polyethylene (PE) resins, such as high-density polyethylene (HDPE), low density polyethylene (LDPE), and linear low-density polyethylene (LLDPE). Those mentioned are the predominant forms included in this report.

1 The U.S. Environmental Protection Agency (EPA) defines "post-consumer material" as a material or a finished product that has served its intended use that is then diverted or recovered before it is disposed as solid waste. It is the material consumers and businesses collect for recycling; it does not include manufacturing waste, which is commonly reused in the original manufacturing process. The EPA defines "pre-consumer" as material that is recycled before it is used by a consumer. (EPA WebArchive - https://archive.epa.gov/epawaste/conserve/smm/wastewise/web/html/buyq_a.html). This report uses EPA's definition throughout, wherein "post-consumer" refers to plastics that have been previously used for their intended purpose by consumers and businesses. Commercial materials that have met their intended use are often recovered outside of curbside or drop-off collection programs and include items such as totes, pallets, crates, and other commercial packaging. This report does not cover the recycling of post-industrial (pre-consumer) materials. An example of post-industrial material is scrap or trimmings that are generated in manufacturing and converting processes.

2 Recovery" or "recovered" throughout this report refers to material collected for recycling and sold to domestic or export buyers.

A minimum of one billion pounds of post-consumer film (which includes plastic bags and wrap) was recovered for recycling in 2017, an increase of 54 percent since 2005 with domestic recycling continuing to rise in 2017. Export buyers purchased significantly less post-consumer film in 2017 than previous years, resulting in a 315-million-pound decrease in the total film reported for recycling, compared to the 2016 total.

Domestic buyers, U.S. and Canadian processors, purchased two percent more film in 2017 than 2016, and the largest amount since the report was first compiled. Domestic processing of PE Retail Bags and Film reached the highest levels since 2014. Polyethylene (PE) Retail Bags and Film is the category that includes consumer-returned bags and wrap.

Figure 1: Purchases of U.S. Post-consumer Recovered Film

38 percent was exported. Export purchases were down by 46 percent. For the first time since 2011, more material was recovered by domestic buyers than export buyers. The net result was a 24 percent overall decrease in post-consumer film recovered for recycling from 2016 to 2017.

PE Clear Film continued to comprise the largest category of film recycled, with a total of 393 million pounds recovered. PE Retail Bags and Film was second at 225 million pounds recovered. The PE Clear Film category had a 27 percent drop, by weight, in 2017 mostly driven by a decrease in export purchasing. In contrast, PE Retail Bags and Film increased 15 percent from 2016 with domestic buyers driving the increase. PE Agricultural Film—the third largest—decreased to 164 million pounds. The recovery of PE Colored Film, the fourth largest category, decreased nearly 50 percent to 149 million pounds. Materials Recovery Facility (MRF) Curbside Film and "Other Film" categories also decreased but comprise only a small portion of the materials that are collected for recycling by weight. (See page 4 for film category definitions.)

Data on recovered post-consumer plastic film is collected through a voluntary, annual plastic recycling survey that also gathers data on plastic bottles, non-bottle rigid plastics and other plastics.

THE FOLLOWING STEPS ARE TAKEN TO PREPARE THE REPORT

- MORE continually updates its markets database to include current exporters, reclaimers, and other handlers of plastic scrap;
- MORE conducts an electronic survey of market participants in plastic recycling to collect data; and
- MORE undertakes a follow-up step for survey-collected data, to help check the accuracy of the data through follow-up calls, conversations with industry contacts, and reviews of other sources of recycling industry information.

DATA COLLECTION AND ANALYSIS

MORE continually updates a proprietary database of plastic exporters, processors, reclaimers, and key brokers to help ensure that the survey reaches the key plastic scrap buyers from North America.[3]

MORE uses a custom-designed, web-based survey system to gather data. Although the overall methodology has not changed since the first report, MORE continually seeks ways to improve the completeness and timeliness of survey responses. These changes allow for better material flow tracking and assist with prevention of double counting.

The survey is distributed by sending an email with a unique link to each survey contact, including both U.S. and Canadian reclaimers, export buyers for all post-consumer plastic, as well as some key players within the value chain, such as MRFs, brokers, and end users. After an appropriate amount of response time has passed, MORE employees send follow-up emails and make telephone calls to retrieve data. The data are entered in an online survey tool, either directly by the company being surveyed, or by MORE staff in conjunction with the relevant company. Incoming data are reviewed for accuracy, and follow-up calls are made as needed. After data collection is complete, the data are compiled and categorized based on the detail reported.[4]

The final data totals are reviewed, analyzed and reported with as much detail as possible without compromising confidentiality. In order to determine trends and identify anomalies that may require further vetting, the analysis includes year-to-year comparisons of totals, material categories, and trends among exporters and reclaimers. This quality control, which often requires follow-up with survey responders, is essential to determining if there has been an actual shift or just an entry error by the responder. Clarification may also be needed to determine whether reported

3 Through MORE's project work in the industry and the websites it manages—PlasticsMarkets.org, RecycleMorePlastic.org and directories on PlasticFilmRecycling.org—MORE regularly engages with companies and new contacts in this sector. MORE also identifies potential buyers through published market databases and conversations with suppliers, such as materials recovery facilities (MRFs) and reclaimers.

4 MORE conducts the survey and takes steps to maintain the confidentiality of individual responses; including procedures designed so that no individual company data are released, nor any specific data that does not have at least three companies reporting.

material can be counted as post-consumer/commercial or if it is, in fact, post-industrial scrap. Describing how the data are collected, and what is and is not included in the survey, provides readers of this report with the transparency needed to cross-reference the results with other recycling data.

FILM CATEGORIES

The 2017 survey used the following material categories:

- **PE Clear Film** - Clear, clean polyethylene (PE) film from commercial sources, including stretch wrap and poly bags
- **PE Colored Film** - Mixed color PE film from commercial sources, including stretch wrap; no post-consumer bags
- **PE Agricultural Film** - Includes clean and dirty agricultural film. Dirty agricultural film has been in contact with the ground and may include up to 50 percent contamination (e.g., mulch film). Clean agricultural film has been used in applications that do not involve contact with the ground and may include up to 10 percent contamination (e.g., greenhouse film)
- **PE Retail Bag and Film** - Mixed color, clean PE film, including stretch wrap and retail collected post-consumer bags, sacks, and wraps
- **MRF Curbside Film** - Post-consumer PE Mixed film collected curbside and sorted at a MRF
- **Other PE Film** - A "catch-all" for PE film that does not fit in any of the categories above
- **Other Non-PE Film** - A "catch-all" for non-PE film that includes polypropylene (PP) and polyvinyl chloride (PVC).

Note: Other PE and Other Non-PE Film are reported as an aggregate category of Other Film for the purposes of this report.

DATA GAPS AND ASSUMPTIONS

Participation in the survey is voluntary and the reported data are based on the responses received. Many companies have limited resources to put towards participation in the survey, and some companies may choose not to respond due to their confidentiality policies. Therefore, because there is not 100 percent participation, the presented totals represent the minimum amount of plastic film recovered for recycling and sold on the marketplace. Only data provided by North American reclaimers and exporters selling directly overseas, are included in the reported totals, unless we determine that data is missing in areas where substantive information from other reliable sources is available. Only U.S. and Canadian reclaimers currently respond to the survey. If reclaimers omit their capacity data, MORE uses the pounds purchased for recycling as an estimate of their respective capacities. Data provided by brokers and MRFs are primarily used as a reference to better understand the flow of material, but MORE may include their data if enough information is provided that would enable attribution of material sold to a non-responding reclaimer or exporter.

Again, since participation in the survey is voluntary, MORE sometimes receives responses from existing companies that did not previously respond. Changes in year-to-year recovery rates are often a combination of changes in collection, along with material that was recycled in previous years, but not reported. When MORE can ascertain the nature of an increase (or decrease), the reasoning is indicated. However, it can be difficult to make a reliable determination in any given year, depending on the depth of information MORE receives from plastic handling companies from previous years and while taking into account the need to protect confidentiality.

MORE tracks exporters' purchasing of plastic film through a number of industry resources. Except for the largest exporters, players in the export market come and go, and may change the type or mix of materials that they purchase. Increased volatility in the export market began in 2017 with the National Sword policy in China restricting the import of scrap materials, which took effect in 2018 when the data for 2017 was gathered. This situation made it a particularly challenging year to track exporters.

In addition to the potential impact of non-responders, changes in how responders report pounds in the survey categories impact the totals reported year over year. There is some play between responders reporting pounds in PE Retail Bag and Film and PE Colored Film. Also, responders may lump a mixture of film categories in Other PE Film rather than break out their purchased volumes into the individual PE film categories.

Determining the amount of post-consumer bags and wrap recovered for recycling is not straightforward. Most retailers combine consumer-returned bags and wrap with back-of-house operations commercial film for transport to markets that can reclaim a mixture of polyethylene film. These bales are reported by reclaimers and exporters in the PE Retail Bags and Film category. MORE estimates the recovery of post-consumer bags and wrap from consumers by adding a percentage of the PE Retail Bags and Film total to the total MRF Curbside Film. The percentage used is based on percentages reported by reclaimers and their market share and is explained in more detail in the "Findings, Post-consumer Bags and Wrap Recycling" section below.

FILM RECYCLED

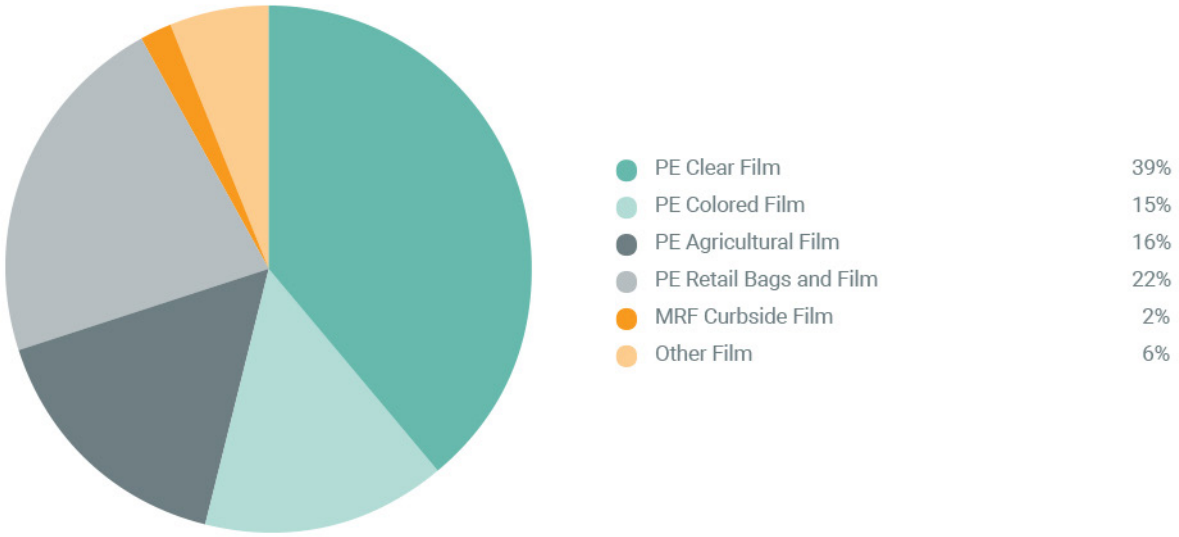
In 2017, the amount of plastic bags and film reported as recovered for recycling in the U.S. was one billion pounds, an increase of 54 percent since 2005. The 2017 numbers also represent a decrease of 315 million pounds compared to 2016 values, and the lowest total reported for recycling since 2010. In 2017, domestic recycling continued to rise. Approximately 62 percent of the total quantity recovered was reclaimed in the U.S. or Canada, and the remainder was exported overseas. The amount of material reported as recycled by U.S. or Canadian processors increased by two percent from 2016, for the fifth consecutive year-over-year increase and the highest amount reported in the history of this report. As previously noted, because participation in the survey is voluntary, the data in the report does not reflect 100 percent of the film plastic that was acquired for recycling.

Table 1: U.S. Post-consumer Film Recovered for Recycling

Year	Exported (Millions of Pounds)	Acquired for use in US or Canada (Millions of Pounds)	TOTAL (Millions of Pounds)
2005	183.7	468.8	652.5
2006	221.1	590.9	812.0
2007	462.6	367.6	830.2
2008	470.0	362.4	832.4
2009	490.7	363.7	854.4
2010	456.0	515.8	971.8
2011	426.7	583.0	1,009.8
2012	601.9	418.6	1,020.5
2013	656.3	479.7	1,136.1
2014	645.7	519.4	1,165.1
2015	622.5	576.6	1,199.1
2016	704.4	617.7	1,322.1
2017	377.6	629.1	1,006.7

Depending on how and where it is collected, recovered film bales may contain combinations of HDPE, LDPE, and LLDPE resins or may contain a single resin. For example, stretch film (e.g., pallet wrap) is either collected separately and marketed as PE Clear Film, or it may be mixed with other polyethylene film—including post-consumer bags and wrap—and marketed as PE Retail Bags and Film. Stretch film represents a significant majority of the post-consumer film recovered.

Figure 2: 2017 Percentage of Pounds of Recovered Film by Category



Recovery of PE Retail Bags and Film was the only category to increase in 2017, as compared to 2016. The following categories all decreased in pounds reported: PE Clear Film, PE Colored Film, PE Agricultural Film, MRF Curbside Film and Other Film. Export purchasing dropped for all film categories, and U.S. and Canadian reclaimer purchasing dropped for MRF Curbside Film, PE Clear Film, and Other Film.

Table 2: 2017 Millions of Pounds of Recovered Film by Category

Recovered Film Category	Millions of Pounds Recovered in 2017	Change Since 2016	% Consumed by U.S. & Canadian Reclaimers
PE Clear Film	392.9	-27%	48%
PE Colored Film	149.2	-49%	71%
PE Agricultural Film	164.2	-15%	89%
PE Retail Bags and Film	225.0	15%	81%
MRF Curbside Film	18.3	-12%	16%
Other Film	57.1	-34%	9%
Total	1,006.7	-24%	62%

POST-CONSUMER BAGS AND WRAP RECYCLING

Plastic bags and wrap are commonly commingled with stretch film wrap and other retailer-generated scrap film for efficient collection at retail locations; therefore, "bag only" bales, containing only bags and wrap, are rare. Thus, as indicated in the ***Data Gaps and Assumptions*** section, the total amount of recovered post-consumer bags and packaging is defined in this study as the combined total of MRF Curbside Film with a specific percentage of the PE Retail Bags and Film bale.

Using the available data, MORE estimates that 147 million pounds of post-consumer bags and wrap were recovered for recycling in 2017, which is an 11 percent increase from 2016. A private national bale audit in the retail sector provided the percentage of bags in PE Retail Bags and Film bales from 2012-2017.[5] Based on the findings of the bale audit study, this report assumes that approximately 57 percent of PE Retail Bags and Film bales are post-consumer bags and wrap, approximately 37 percent is stretch wrap, and the remainder is contamination. Approximately 20 percent of the post-consumer bags and wrap are retail carryout bags and the remaining material is post-consumer packaging wrap and other bags. Given the historical variability in percentages, this is a conservative estimate of consumer-returned bags and wrap recovered for recycling.

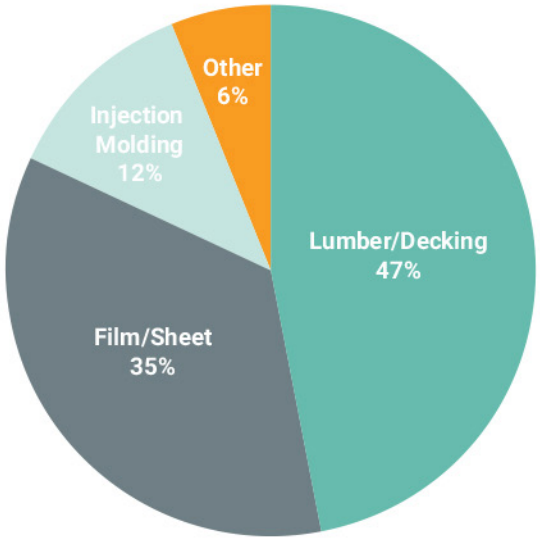
5 Prior to the 2012 Report, MORE used an average of the percentages of bags in PE Retail Bags and Film bales reported by reclaimers. In addition to the private bale audit study, the Flexible Film Recycling Group (FFRG) conducted bag audits on material recovered during Wrap Recycling Action Program's (WRAP) educational campaigns in WI, WA, and CT to assess the impacts of specific signage and education at the retail level on the quality and volume of recovered film. More information about WRAP reports, including bag audits, is available on PlasticFilmRecycling.org (see the Recommendations section for information about WRAP).

DOMESTIC CAPACITY AND END MARKETS

MORE estimates that in 2017 there was approximately one billion pounds of plastic film reclamation capacity in the U.S., which includes total capacity to wash or process unwashed material directly into regrind, agglomerate, pellets, or end products.[6] The utilization rate was 63 percent in 2017. There was an increase in domestic purchasing of U.S. material and a modest decrease in the purchase of non-U.S. film.[7]

Most of the U.S. film processing capacity is for clean polyethylene film, which can be used to make a new product without washing, or for single-resin film (e.g., LDPE only).

Figure 3: Reclaimed U.S. Post-Consumer Film: 2017 End Uses



The primary domestic end uses for plastic film include composite lumber, film and sheet, and injection molding, which may include products such as pallets, crates, and buckets. Composite lumber remains the dominant domestic end use market for post-consumer film.

The survey asked responders to characterize the 2017 market as compared to previous years. Similar to 2016, responders highlighted declining market values and the growing supply of post-consumer material available in the marketplace.

6 Capacity for processing post-consumer film often overlaps with capacity to process post-industrial film and in some cases bottles and non-bottle rigid plastics. The annual United States National Post-consumer Plastic Bottle Recycling Report and the annual National Post-consumer Non-bottle Rigid Plastic Recycling Report likely report some capacity that is also reported here. Thus, adding the non-bottle rigid, bottle, and film capacities from this report and the others could result in some double counting.
7 Utilization, or the rate at which potential production levels are being met, can be determined by dividing the total pounds reported as acquired for recycling from the United States, Canada, and Mexico by the estimated capacity.

NOTE: THE REMAINING SECTIONS OF THIS REPORT PRESENT DISCUSSION AND RECOMMENDATIONS THAT REFLECT MORE RECYCLING'S EXPERTISE AND INDUSTRY KNOWLEDGE.

More Recycling tracks the plastic film recycling market throughout the calendar year. 2017 was the start of a transition away from more than a decade long reliance on export buyers. On top of the loss in demand from China, recyclers struggled with lack of demand from end users. Scrap film values followed a steady downward curve in 2017.

The fundamental challenges outlined in the **2016 Report** persist. Most of the domestic reclamation capacity is focused on clean, dry PE film or single resin material, and the U.S. is not well-positioned to process all of the material available for recycling.

Commercial film recovered for recycling had the most significant drop in 2017 likely due to compounding factors. A decline in commercial collection programs began with the sustained decline in scrap values in 2017. Smaller programs (i.e., less-than-truckload or 40,000-pound quantity suppliers) and lower quality generators without a contract were at risk of not finding a market for their material in late 2017. Many smaller programs relied on haulers that sold to export buyers to take their material. As demand from the export market contracted, haulers began to discontinue their handling of scrap film.

Despite the existing domestic processing capacity for clean, dry PE film, the collection methods for a large portion of commercial film were designed with specifications for export markets competing for this material. Export specifications have historically been less stringent than domestic buyer specifications. Due to a lack of buyers—for the quality and amount of material available—towards the end of 2017, landfilling material started to be more economical (despite diversion or other environmental goals) than covering the handling and shipping costs of getting material to market.

Recovery of PE Retail Bags and Film was the only category to increase in 2017, as compared to 2016. Based on feedback from reclaimers, retailers with quality control in place and the ability to transport collected bags and wrap to their distribution centers for consolidation were able to find domestic markets.

There is not enough data to confirm the increase in post-consumer bags and wrap is due to a specific campaign or program, but it is likely that additional education on how and where to recycle bags and wrap is having a positive impact on the recovery of this material. However, a disconnect remains. While consumers with access to instructional materials are learning how to recycle film, few consumers, including businesses, create demand for recycled content products or packaging. More end use demand is required to achieve a balance with the growing supply of film generated in the marketplace.

With more stakeholders demanding plastic circularity, or the recovery of plastic and prevention of waste, there is a need to highlight the energy and carbon savings in using post-consumer resin (PCR) to stimulate more demand for PCR. According to a 2018 life cycle impact report commissioned by the Association of Plastic Recyclers, the use of PCR offers significant energy savings when compared to virgin resin.[8] Illustrating the benefits in using recycled content stimulates demand, which can stimulate investments, to shore up the domestic infrastructure and engage all to participate in recycling.

Demand for PCR is starting to grow, most prominently in Europe, but there are significant supply and demand disconnects. For example, PCR quality varies drastically and most of the demand is for the PCR that has near virgin plastic quality. Using PCR in applications that currently use highly engineered resin and packaging requires increased innovation in plastic film recovery. Recyclers are dealing with more varied feedstock streams (i.e. varying types of bags and wrap), while also trying to compete with more specialized virgin resin for use in new products. The cost of producing PCR is growing with the increased specialization of film applications and the increased variety of film products on the market.

Companies that put PCR in products are not yet recognized or rewarded for their greenhouse gas savings outside of environmental branding to a limited but growing segment of consumers. When more consumers reward companies that use PCR through their purchase of PCR containing products, we will likely see more drive for recycling and less plastic waste. Initiatives and policies designed to align the goals of diverting material from landfills and reducing greenhouse gas emissions are essential.

Two fundamental needs remain in order for film recycling to improve:

- **More demand to absorb the material currently collected (and the additional material with the potential to be collected)**
  - Reclaimers are struggling to compete with virgin resin, including off-spec, which is dampening the market demand for PCR film. Without demand there is a disincentive for improving the collection and processing infrastructure. Without value on energy savings in material choices, demand will likely remain a challenge.
- **More education on how and why to recycle film**
  - Once there is demand for recycled film by end users, and therefore those processing film for those end users, there will still be a need to motivate consumers to take the action of recycling. Most people have not yet been educated about what types of film can be recycled, or that it can and should be recycled at participating drop-off locations. For example, a survey in Florida (a recent WRAP partner state) revealed that about 70 percent of consumers are unware of how or where to recycle their bags and wrap. With lack of awareness, the quality of the drop-off film recycling stream and curbside recycling streams suffers. The Wrap Recycling Action Program[9] (WRAP) campaigns have demonstrated that consumers do increase participation once they are made aware that we need to recycle.

8 https://plasticsrecycling.org/images/apr/2018-APR-Recycled-Resin-Report.pdf.
9 https://www.plasticfilmrecycling.org/recycling-in-your-community/wrap/.

ILLUSTRATE THE ENERGY SAVINGS THROUGH RECYCLING

While the U.S. has some of the best reporting on what actually happens to post-consumer plastic, a system has not been developed to reward companies that complete the full process of recycling–buying PCR as feedstock for new products or buying products with recycled content. There is a need to recognize companies that invest in using PCR since this results in energy savings and reduced greenhouse gas emissions, as well as diversion from landfills. Furthermore, with little oversight or verification of claims of recycled content[10], market inefficiencies persist. Companies making strides towards circularity or using recycled content may not realize a competitive advantage if the standards on recycled content are unclear or unverified.

To address some of the key challenges, industry groups are working together to develop an information platform, expected to launch in late 2019. This resource is intended to support public and private initiatives aimed at improving the recycling system in the U.S. by: recognizing those using PCR, the environmental benefits associated with using PCR, connecting buyers and suppliers of PCR as well as products made with PCR, showcasing full value chain case studies, and providing an information exchange for recycling market development and other support activities across the country.

CONTINUED HARMONIZATION OF RECYCLING EDUCATION & DESIGN FOR RECYCLING

PlasticFilmRecycling.org has been available to the public for more than 10 years, and the website receives more than one hundred thousand hits each year. Based on direct inquiries from users, site visitors seem eager for more information. Yet a large portion of society remains unaware of the fact that they can and should recycle a long list of household bags and wraps, beyond the carryout bag, at participating drop-off locations. Moving forward, we recommend the recycling industry clarify its messaging on how best to handle film and recyclables in general.

The Wrap Recycling Action Program (WRAP) is a national public education and outreach initiative, created by the Flexible Film Recycling Group in 2013, to increase film recycling by engaging key stakeholders to improve education and to activate collection networks. WRAP case studies demonstrate that broader adoption of WRAP signage among retailers, along with the wide use of the How2Recycle label among brand owners, helps to significantly increase recycling of plastic bags and wraps.[11] While WRAP has proven that education can lead to increased consumer participation and improved quality of collected materials, the impact is limited to the geographic regions that have had focused and sustained education and engagement by partnering retailers, brand companies, and local governments.

Improving the quality of the recycling stream remains a priority for recycling programs such as WRAP. Encouraging organizations and individuals to buy recycled has become an equally

10 There are questions as to whether the PCR required by California's Recycled Content Trash Bag Program is truly PCR or if companies are using post-industrial material and claiming it is PCR.
11 Free signage and other educational materials are available at PlasticFilmRecycling.org.

important priority for most recycling programs. Improving the quality of collected material streams can be improved by enhancing the original design of the product or package, as well as the handling and sorting practices for that package once the product has been used. With key tools like the **APR Design Guide® for Plastics Recyclability** and the **How2Recycle** label working in partnership, there has been positive movement in designing for recycling.[12] However, with demand challenges for PCR, we recommend that future design goals strive for recyclability plus recycled content.

12 The APR Design Guide for Plastics Recyclability, http://www.plasticsrecycling.org/apr-design-guide/apr-design-guide-home; How2Recycle label - www.how2recycle.info.

ADDITIONAL INFORMATION

The Plastics Division of the American Chemistry Council (ACC), which provided funding to More Recycling (MORE) to prepare this report, provides resources to assist communities, businesses and others to increase awareness and education about the recycling of plastic bottles, containers, bags, and film. MORE is a recognized expert in the field of plastics recycling and has been conducting recycling studies for over 27 years. This work has been conducted and evaluated in an objective manner by persons qualified to do so, using procedures generally accepted in the profession. Visit **www.PlasticFilmRecycling.org** for updates on WRAP programs, including results from campaigns. MORE provides technical support for WRAP, which is primarily funded by ACC's Flexible Film Recycling Group. Also visit **www.PlasticsMarkets.org**, which is maintained by MORE, for information about additional markets and handling guidelines. This report and others on plastic recycling can be found at **www.MoreRecycling.com**.

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