

Building a Sustainable End-of-Life Management System for Flexible Plastic Packaging and the Importance of Recycle- Ready Packaging

A Technical White Paper Prepared by:



Commissioned by: Winpak Ltd.

November 2020

Acknowledgements

Winpak and Circular Matters would like to thank the following individuals, plus those choosing to remain anonymous, who provided data, insight and/or expertise that greatly assisted this research – recognizing that they may or may not agree with all of the interpretations/conclusions of this paper.

Cassandra Childs, Association for Plastic Recyclers

Nina Goodrich, Sustainable Packaging Coalition

Alison Keane, Flexible Packaging Association

Trina Matta, The Recycling Partnership Film and Flexibles Coalition

Contents

Executive Summary	1
Introduction	2
Flexible Packaging Use in the U.S. and Canada	3
FPP Benefits.....	5
Sustainability Concerns.....	6
End-of-Life Management Options.....	6
Composting	6
Recycling.....	7
Plastics to Fuel	8
Consumer and Regulatory Pressures	8
Consumer Expectations.....	8
Legislative Action and Trends	9
Response of Brands and Other Stakeholders	12
Voluntary Initiatives.....	12
Initiatives to Drive Policy Action	14
Implications Going Forward	16
Recycling Options	17
Curbside Recycling.....	17
Mail-in Recycling.....	20
Recycling via Store Drop-Off.....	20
More on Reclamation and End Use	22
Importance of Design for Recycling.....	24
Recyclability.....	24
Recycle-Ready versus Recyclable.....	25
Collaboration – Essential for Success.....	25
Building the System of the Future	26

Figures

Figure 1: Total U.S. Packaging Market Percent Breakdown by Segment.....	4
Figure 2: U.S. Flexible Packaging Industry Breakdown by End-Use Market 2019	5
Figure 3: Summary of Key Relevant State Legislation Introduced in 2019/2020	10
Figure 4: Activators of the U.S. Plastics Pact.....	13
Figure 5: Reclaimed U.S. Post Consumer Film 2018 End Uses by U.S. and Canadian Reclaimers	21
Figure 6: Participants in the FPP Recycling System Stakeholders.....	28

Plastics and plastic packaging have become a lightning rod topic in our recent past and certainly, that continues today. Our industry recognizes with the broad use of plastic packaging a responsibility exists to look at the entire value chain, including end-of-life. There is a need to move beyond our current linear economy where packaging is disposed after use to a Circular Economy where this valuable resource is collected, re-processed and used again as another package. The material structures, technologies, and systems required to fully realize this end state will not occur overnight. However, urgency and industry collaboration are a priority. Through this White Paper, we hope to share useful insights and learnings from subject matter experts in the packaging space and shed light on the importance of Recycle-Ready packaging as we progress towards a Circular Economy.

- Phillip Crowder, Director, Corporate Sustainability, Winpak

Building a Sustainable End-of-Life Management System for Flexible Plastic Packaging and the Importance of Recycle-Ready Packaging

By Betsy Dorn and Susan Bush, Circular Matters LLC

Executive Summary

The packaging world is extremely dynamic and issues around plastic packaging, in particular, are complex. Flexible plastic packaging (FPP) has emerged as the second most popular packaging format (19% of packaging sales in the U.S.) after corrugated cardboard (24%), and its market share will continue to grow at an estimated compounded annual rate of 3.16% in North America between 2020 and 2025.

The benefits of FPP that have contributed to its market popularity include its lighter weight, strength, print surface, and convenience features such as resealable zippers, spouts, heat-in-package potential, and ability to evacuate all of the product. There are also sustainability benefits, such as use of less material, lower use of water and energy during manufacture, and more efficient transport before and after filling, leading to reduced greenhouse gas (GHG) emissions. FPP can also extend product shelf life, thereby protecting the embedded resources.

Although FPP has many benefits, one significant drawback has been a lack of sustainable end-of-life management options. Single-use plastic packaging is now being targeted in many state, provincial, and federal bills and laws in the U.S. and Canada, largely prompted by concerns with plastics in the environment – particularly in marine environments. Recyclability is seen as an increasingly critical feature in packaging, being demanded by not only consumers, who see recycling as nearly synonymous with “sustainable,” but also with brands and retailers, who have made bold recyclability (and/or compostability/reusability) goals relative to packaging, with 2025 as a common timeline.

Packaging formats have changed over time, but the North American recycling system has not kept

pace. Current material recovery facilities (MRFs) are not configured and equipped to separate flexible plastic packaging and films from other materials and consequently do not accept these items. In addition, many FPP formats are made of multiple resins/material types, including thin metallic and paper layers, hindering their ability to be recycled mechanically even if they were successfully collected and sorted for recycling.

Numerous industry organizations and non-governmental organizations (NGOs) are working to develop and move recycling systems for FPP forward. Also emerging is chemical recycling, which converts certain types of plastic to original chemical building blocks that can be used to make other products. Most in the industry, however, see mechanical recycling as preferable to chemical recycling, due to its lower cost and greater resource efficiency. In addition, chemical recycling is likely at least five years from being widely available in most of North America.

A polyethylene (PE) film store drop-off recycling system exists throughout North America today – designed to provide opportunities for consumers to recycle plastic carry out bags and other selected PE film items such as bread bags and paper goods wrap. The American Chemistry Council (ACC), Association for Plastics Recyclers (APR) and Sustainable Packaging Coalition (SPC) have worked collaboratively with retailers and end markets to enable the inclusion of PE flexible plastic packaging in this recycling system. Multi-resin/multi-material FPP cannot be recycled via store drop-off as it is not accepted by the PE film end markets served by this system. In order to inform consumers about which type of FPP can be recycled through store drop-offs, the SPC has created a How2Recycle label specifically for this purpose.

Given the availability of this recycling option, some packaging manufacturers are developing “recycle-ready” FPP comprised of PE or predominantly PE resin with minor additional compatible material types that can be recycled if clean and dry in return-to-retail film collection programs. Brands using recycle-ready packaging need to include appropriate labeling on the package to help ensure consumers are aware of its recyclability and how to do so.

Production of recycle-ready packaging that meets the performance attributes previously met by multi-resin/multi-material FPP requires investment in research and development and its use may entail process adjustments, given the different material characteristics of this packaging format. Packaging converters and brands may incur additional cost and, for early pioneers, even some market risk in doing so, but using Recycle-Ready FPP is an important step towards achieving the circular economy. Expanding the development, use, collection and recycling of FPP will be most successful through collaboration of all involved in the packaging supply chain, including consumer packaged goods (CPG) brands, film manufacturers, packaging converters, closure manufacturers, machinery suppliers, haulers, MRFs, consumers, recyclability suppliers, reclaimers, and end markets. Challenges will be encountered along the way, but commitment to overcoming them and ongoing innovation will lead to success.

Introduction

The packaging world is extremely dynamic and issues around plastic packaging, in particular, are complex. This paper takes a holistic look at current issues and challenges associated with end-of-life management of flexible plastic packaging, particularly in light of today’s focus on the circular economy, and the role of “recycle-ready” packaging in the journey of developing sustainable end-of-life management solutions for flexible packaging. Topics covered in this paper include why manufacturers are developing recycle-ready versions of their packaging products, challenges and

opportunities associated with use of recycle-ready packaging, how various stakeholders are engaging in this arena, the end-of-life management of plastic packaging in general, and thoughts on where to go from here.

Information for this paper was obtained through internet research, multiple interviews with industry representatives, webinar and conference presentations, and Circular Matters' company files and experience.

We begin with a discussion of flexible plastic packaging and the North America market.

Flexible Packaging Use in the U.S. and Canada

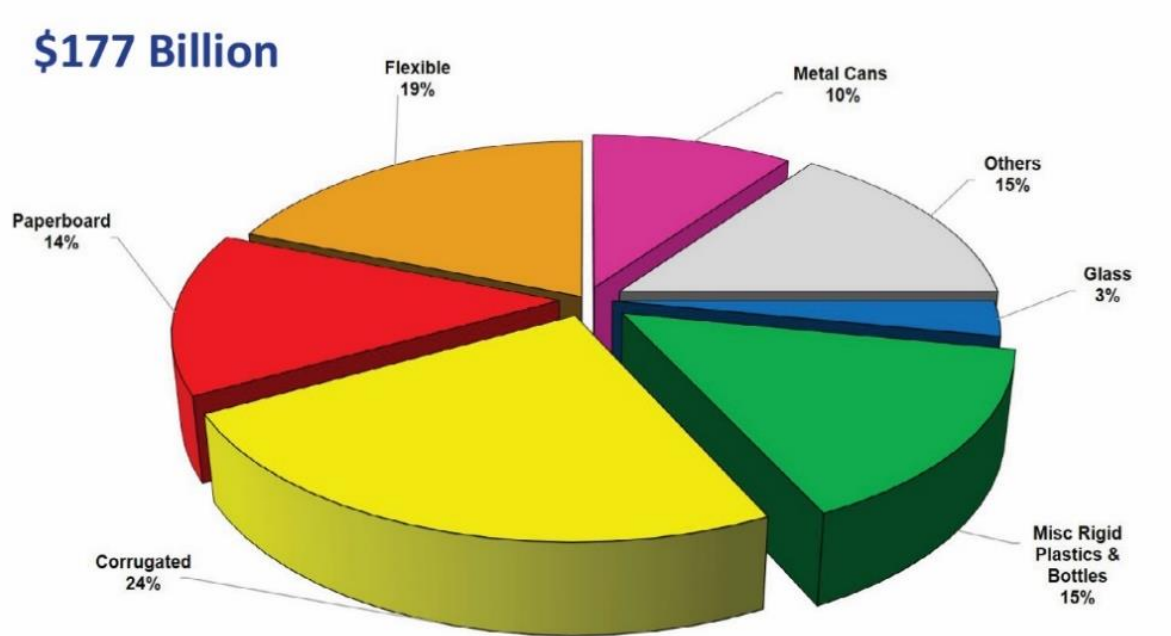
Flexible plastic packaging (FPP) has emerged as a popular packaging choice for many types of products packaged and sold in the U.S. and Canada. According to the Flexible Packaging Association (FPA), "flexible packaging is any package or any part of a package whose shape can be readily changed." FPP is made from various materials including polyethylene, polyvinyl chloride, polypropylene and polyester as well as paper and foil. Many flexible packages are made of three to nine layers for different product protection benefits. Additionally, FPP can take on many shapes, such as a bag, pouch, sleeve or wrap or can be film packaging components such as lidding, liner or overwrap.

Flexible plastic packaging has experienced phenomenal growth over the last two decades. According to Mordor Intelligence, the North American flexible plastic packaging market is expected to continue to grow at a compounded annual growth rate of 3.16% over the forecast period 2020 - 2025. The United States holds the key market share in the region, due to the existence of established industries such as the pharmaceutical, food and beverage, etc. However, Canada is anticipated to see a higher growth rate due to growing use across numerous industries, supported by Canada's strong retail industry.

FPP market share now exceeds all other packaging forms in the U.S. except for corrugated containers and claiming 19% of the \$170 Billion U.S. packaging market. Comparable data for Canada is not available, but it is presumed that the breakout of packaging is similar. Globally, flexibles represent 39% of packaging.

The market share of packaging types in the U.S., based on total sales, is provided below.

Figure 1: Total U.S. Packaging Market Percent Breakdown by Segment



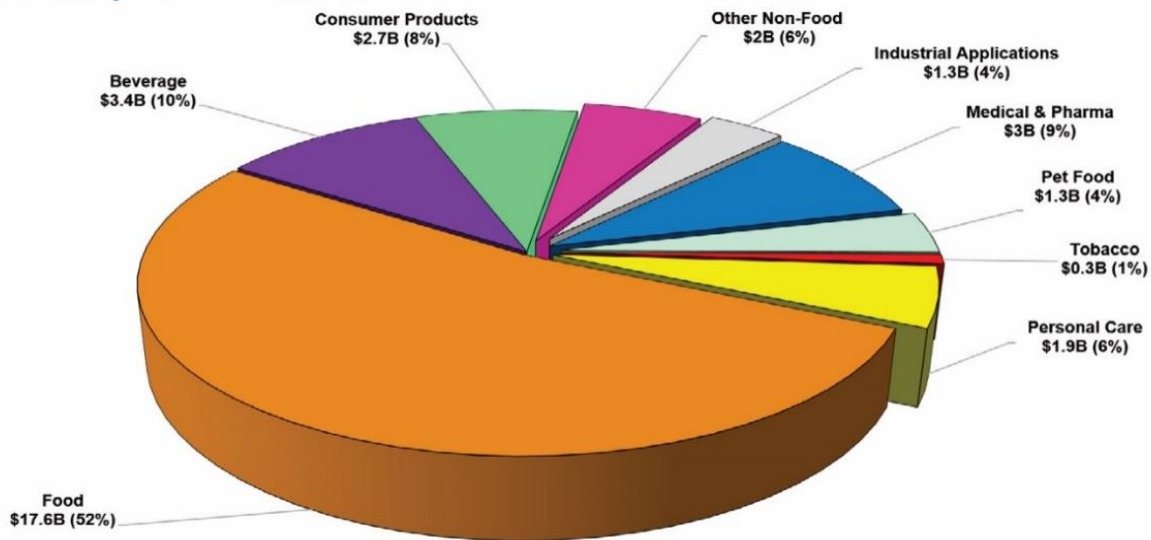
Source: Latest U.S. Census Bureau ASM and Flexible Packaging Association

Image courtesy of U.S. Flexible Packaging Association, 2020 (2019 data).

FPP is used for an array of goods. The most prevalent use is for food products, followed by beverages, then medical and pharmaceutical products. Within the food sector, the FPA reports that 52% of packaging is FPP.

Figure 2: U.S. Flexible Packaging Industry Breakdown by End-Use Market 2019

Total \$33.6 Billion



Source: FPA 2019-2020 State of the Industry and Industry-Wide Converters Surveys composite member and non-member data.

Image courtesy of Flexible Packaging Association, 2020.

FPP Benefits

FPP has grown in popularity due to its many benefits desired by consumers as well as brand owners. Examples of specific benefits include:

- Positive shelf presence, with a large print surface
- Ability to be made in unique, eye-catching shapes
- Ability to incorporate consumer conveniences such as spouts, caps and resealable zippers, and ability to cook in packaging
- Ability to allow for greater product evacuation
- Strength and resistance to breakage and dents
- Suitability for a burgeoning e-commerce marketplace – with both lightweight and strength attributes
- Unbreakable, no sharp edges

Besides the benefits described above, FPP offers substantial sustainability benefits relative to other packaging choices. For example, FPP:

- Uses fewer raw materials, by weight, than other types of packaging (allows for “reduction” in packaging, a higher-level activity in the waste management hierarchy than recycling);
- Requires less energy and water in its production than other types of packaging;
- Due to its lower weight, has a higher product-to-package ratio, reducing transportation impacts (including GHG emissions), and is also reflective of consumer value;

- Before filled, is shipped on a roll or flat, achieving transportation efficiency relative to more voluminous, heavier rigid packaging (therefore reducing transportation GHG impacts); and
- Protects product, resists breakage, thus protecting resources including by extending product shelf life due to barrier layers (thus preserving the product's embedded resources).

Sustainability Concerns

Although possessing many sustainability benefits, flexible plastic packaging, because of its prevalence and many single-use applications, is a significant contributor to the negative environmental images associated with plastic packaging overall. Plastic packaging and other single-use plastic items have been the subject of countless news and social media stories in recent years due to the prevalence and visibility of plastics in oceans and other waterways, and in litter in general – a global concern of tremendous proportions. In addition, China's passage of scrap plastic import restrictions and the subsequent similar policy actions of other countries who were also on the receiving end of scrap plastic shipments from foreign countries has resulted in substantially reduced export market outlets for recovered plastics that many U.S. and Canadian suppliers were relying upon. Recycling opportunities for many forms of plastic have suffered as a result, bringing additional awareness of the fact that most plastics are at best landfilled if they don't end up in the environment, and that this situation has been worsening instead of improving. These issues, in combination, have brought negative attention globally on mankind's heavy reliance on plastic, and have spurred a desire and action on the part of consumers, environmental NGOs, legislators, retailers and brands to reduce the use of plastic and ensure that what is generated and used is sustainably managed at end of life.

While not a primary focus for the flexible packaging sector for many years, this is now a major concern for virtually all associated value chain players. The Flexible Packaging Association has been spending much time and attention on this issue. FPA's President and CEO, Alison Keane, stated that "sustainability has always been important in packaging, and flexible packaging has so many important sustainability benefits. It is a journey, however, and now is the time to concentrate on circularity for flexible plastic packaging, closing the loop between its environmental benefits, like its resource efficiency and lower carbon footprint, with end-of-life management solutions, such as recyclability and compostability."

End-of-Life Management Options

Existing non-disposal end-of-life management options for FPP include composting, recycling and recovery for use as fuel. These options and the extent of their current use are briefly described below.

Composting

Although there are some compostable plastics, recycling is generally considered superior to composting for FPP (and plastic packaging in general) for the following reasons:

- Recycling plastic achieves a higher-value use than composting (keeping the material in a "closed loop" in circular economy parlance) and composting was not found to consistently result in lower life cycle impacts than recycling according to a study conducted for

Oregon’s Department of Environmental Quality.¹ Further, recycling plastic “keeps the molecule in play,” unlike when compostable plastics are composted.

- The ability to compost plastics designed for composting is dependent upon the composting process and characteristics used.
- Most compostable plastics do not rapidly biodegrade in the environment or via backyard composting and must be routed to industrial composting facilities. However, few composting facilities exist in North America that can adequately process compostable plastics. Biocycle estimates that 200 industrial composting facilities that could potentially compost plastic packaging exist in the U.S., and less than half of them actually accept compostable plastics.
- It can be challenging to ensure that generators only place compostable plastics in the compost stream. Removing plastic contaminants from compost is challenging and costly. For this reason, even compost facilities capable of successfully processing compostable plastics often do not accept them.

Overall, access to industrial composting facilities is inadequate in both the U.S. and Canada to rely on composting of plastic packaging as a solution available today. Despite these challenges with compostable plastic packaging, there are a limited number of flexible packaging items for which composting may emerge as preferable to recycling, such as condiment sachets and other small flexible packaging that cannot be adequately cleaned for recycling, and/or items that are not currently recyclable (such as cutlery and single-use straws).

Initiatives are also underway to develop and manufacture plastics that can biodegrade in nature. This can be especially advantageous for items that tend to end up in the litter stream – particularly in developing countries where solid waste management infrastructure is substantially lacking.

Recycling

Recycling is currently the preferred end-of-life management option for plastic packaging, given the availability of collection and processing infrastructure and end markets for recovered plastics. However, the U.S. EPA estimates that only 13% of all plastic packaging (flexible and rigid) generated in the U.S. is being recycled. Even materials with fairly well-established recycling collection and processing infrastructure are not recovered at very high levels (PET bottles and jars: 29%; HDPE natural containers; 31.2%).² In Canada, the recycling rate for plastics overall (including durable goods) is estimated to be 9% (like that of the U.S.), with a 15% recycling rate/21% diversion rate for plastic packaging (2016 data).³

While it is technically possible to recycle FPP, current recycling options for FPP are very limited due to the chemical and physical properties of this packaging and all of its variations. Chemical recycling technologies and operations are in early stages of development that will provide additional opportunities to recycle FPP in the future. These and other recycling system options are

¹ Franklin Associates, “The Significance of Environmental Attributes as Indicators of the Life Cycle Environmental Impacts of Packaging and Food Service Ware Final Report,” August 2018.

² U.S. EPA, [Advancing Sustainable Materials Management:2016 and 2017 Tables and Figures](#), November, 2019.

³ Environment and Climate Change Canada, Economic Study of the Canadian Plastic Industry, Markets and Waste, 2019.

discussed in more detail later in this White Paper.

Plastics to Fuel

FPP can be converted into engineered fuel -- an energy product engineered to specifications to result in a fuel that is a direct replacement for traditional non-renewable resources, such as coal. While this use does not constitute recycling, nor does it contribute to circular economy building, it does divert material from disposal and reduces the use of fossil fuels. It also has the benefit of providing a cleaner burning alternative, generally with lower energy requirements for producing and transporting the fuel than traditional fuels. Engineered fuel is primarily used in cement kilns in the production of clinker. The high energy value of the engineered fuel means it can be used in place of coal to achieve the required temperatures needed to produce the clinker. This is currently the outlet for British Columbia's "Other Flexible Packaging" that is recovered through drop-off depots (discussed later in this paper) and is considered to be a bridge market until a recycling solution is developed. Selected forms of FPP can also be converted to oil via various pyrolysis technologies. Use of plastics as fuels is seen as a less desirable recovery option for FPP, as the ability to continuously reuse materials is eliminated when material is burned.

The collection, processing, and end use infrastructure in the U.S. and Canada needs to expand significantly in order to ensure widescale sustainable end-of-life management of plastic packaging and even more so for flexible packaging, due to unique characteristics making recycling this material particularly challenging. The pressures to do so are mounting, as described in the following section.

Consumer and Regulatory Pressures

Consumer Expectations

Numerous research studies show that consumers value sustainability, and more specifically recyclability, in making purchasing decisions. As one example, a survey of 6,000 consumers conducted by Accenture in April 2019 found that more than half of consumers said they would pay more for sustainable products designed to be reused or recycled.⁴ With the onset of the Covid-19 pandemic, consumer attitudes have shifted to favoring packaging that protects food and products from contamination.⁵ A recent Shelton Group consumer survey found that the percentage of consumers concerned about plastic waste declined from 59% (pre-Covid) to 40% in May 2020.⁶ However, the same survey determined that interest in recycling has remained strong: 80% of respondents agreed that recycling was the bare minimum we can do for the environment, 72% said they recycled via a curbside collection service and 39% said they were more likely to buy items that they know are recyclable. So, while plastic packaging and single-use plastics are viewed somewhat more favorably today than before the onset of Covid-19, consumers still desire plastic packaging to be recyclable.

⁴ Accenture Chemicals Global Consumer Sustainability Survey 2019.

⁵ David Luttenberger, Global Packaging Director, Mintel Global Pouch Forum 2020 Presentation.

⁶ Shelton Group, Recycling Pulse 2020.

What is EPR?

Extended Producer Responsibility (EPR) is a mandatory type of product stewardship that includes the requirement that the manufacturer or importer (producer) is responsible for the end-of-life management of its product and/or packaging put forth in the market. For packaging, EPR shifts end-of-life management fiscal and/or physical responsibility to the producer and can also incentivize environmental considerations in selecting packaging. For example, eco-modulation fees can be implemented which can penalize packaging that does not meet certain environmental criteria. To date no EPR for packaging systems are in place for packaging in the U.S., however EPR is in place in several states for specific difficult-to-manage items such as carpet, paint, and mercury-containing thermostats. As described in this paper, several Canadian provinces have EPR in place for packaging.

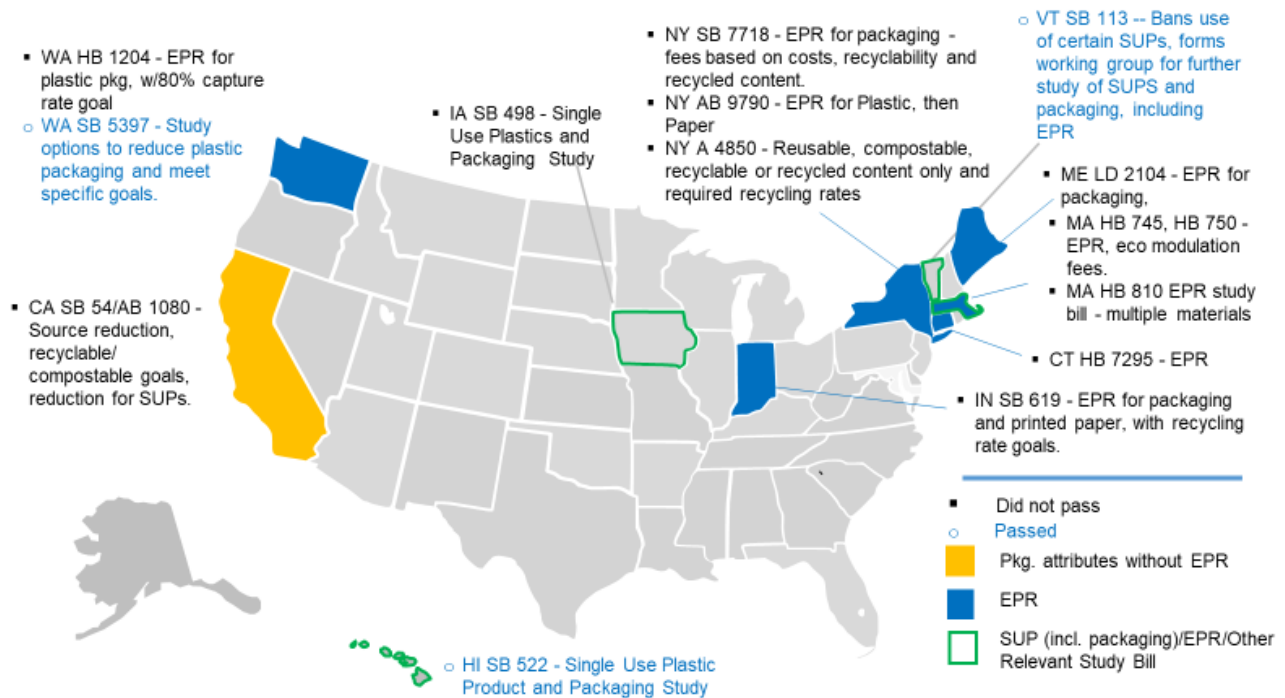
Numerous environmental groups, however, question the recyclability of plastics given statistics like those presented above, and are continuing to put pressure on businesses and governments to eliminate the use of plastic packaging and single-use plastics. The combined interests of consumers and environmental organizations along with recognition for a need to take action to reduce leakage of plastics into the environment have served as major drivers for new legislation globally, which in turn is driving corporate and industry organization action.

Legislative Action and Trends

In the U.S. a variety of single-use plastic and packaging bills and ordinances have been introduced with increasing numbers becoming law. Legislation focusing on consumer goods packaging has included bills that study or implement extended producer responsibility (EPR) for packaging and printed paper, require recycled content for certain types of packaging, implement or expand beverage bottle deposit legislation, restrict the use of plastic packaging (in general or by state agencies), ban the use of PFAS and other health-impacting chemicals in food-contact packaging. Some state-level bills have called for defining recycling and recyclable in a more strict manner, including having end markets for the material collected, or giving the state's environmental agency (or haulers/MRFs) the authority to decide what is considered "recyclable" or "not recyclable." (Examples include WA, CA, NY, VT, FL, CT.)

Significant bills relevant to FPP that have been considered in 2019 and 2020 are summarized in the figure below.

Figure 3: Summary of Key Relevant State Legislation Introduced in 2019/2020



In addition, Oregon DEQ recently conducted a study that describes pathways to modernize the state’s recycling system with EPR for packaging mentioned as an option, and the Connecticut Coalition for Sustainable Materials Management (CCSMM) has established an EPR Working Group to take a closer look at EPR in Connecticut.

Trends in state legislation of particular importance to packaging manufacturers and brands include EPR and/or packaging fees to pay for end-of-life management. Such policies could help develop and fund recycling programs for FPP. In addition, they may define what is recyclable, require recyclability (and/or reusability and compostability) and recycled content, and could potentially include eco-modulation fees to incentivize the use of “environmentally preferable packaging.”

At the federal level in the U.S., several bills have been introduced that could impact single-use plastics and packaging. The bills could help fund recycling infrastructure and education efforts, as well as research and innovation for end-of-life management technologies. Other bills call for EPR and help facilitate public/private partnerships (see text box). Several of these bills have strong industry support. Although uncertain currently, momentum towards passage of federal legislation is without question growing.

Relevant U.S. Bills Under Consideration

The Recover Act – Seeks to help fund infrastructure through \$500 million over five years in matching federal grants, as part of a national infrastructure investment strategy to help upgrade recycling infrastructure and support education efforts. This bill has bipartisan support and is supported by many in the packaging industry.

The Recycle Act – Would create an EPA educational grant program for residential and community recycling programs and provide federal oversight to help increase consumer participation in recycling and ultimately reduce contamination. This bill has bipartisan support, and waste and recycling industries support this bill as a reduction in contamination levels is greatly needed.

Save our Seas Act – Seeks to identify opportunities for innovative uses of plastic waste, minimizing the creation of new plastic waste, including researching options to advance technologies for converting plastic waste to chemicals, feedstocks, and to increase the collection of and end markets for recyclable materials. This bill has bipartisan support and is supported by industry and environmental organizations. It is thought to be one of the bills more likely to pass.

Break Free from Plastic Pollution Act – Establishes requirements related to waste and recycling collection systems. Includes producer responsibility, recycling rate requirements, and recycled content requirements, as well as a national bottle bill and national tax on carry out bags. This bill is supported by the democrats and supported by environmental organizations but not by industry, who would have fiscal responsibilities under the act.

Plastic Waste Reduction and Recycling Act – Seeks to improve the global competitiveness of the United States plastics recycling industry through supporting and facilitating public-private partnerships in emerging plastics recycling technologies and other areas as well as the development of improved plastics separation and recovery. This bill has bipartisan support and has strong support within the plastics industry.

PLASTICS Act Partnering and Leveraging Assistance to Stop Trash for International Cleaner Seas Act – Seeks to advance innovative market-based solutions for recovered plastics and catalyze private capital to prevent and reduce marine debris and plastic waste. Activities include leveraging sources of public and private capital to finance infrastructure investments, supporting capacity-building activities, and entering into cost-sharing, cost-matching, and other cooperative agreements to support and finance such efforts. The bill also seeks to improve waste management systems in developing countries.

In Canada in June 2019, the Prime Minister announced Canada's plan to take additional steps to reduce plastic waste, support innovation and promote the use of affordable and safe alternatives. In particular, the Government of Canada plans to:

- Ban single-use plastics in 2021 (plastic grocery bags, straws, stir sticks, six-pack rings, cutlery and food containers made from hard-to-recycle plastics will be out of use nationwide by the end of 2021)⁷ and take other steps to reduce pollution from plastic products and packaging; and
- Work with provinces and territories to introduce standards and targets for companies that manufacture plastic products or sell items with plastic packaging so they become responsible for their own plastic waste.

⁷ Rachel Aiello, CTV, "[Canada Banning Plastic Bags, Straws, Cutlery and Other Single-Use Items by the End of 2021](#)," October 7, 2020.

Recently the government released a “discussion paper” seeking input on a proposed integrated management approach to plastics to take a number of actions, including regulations which would be developed under the provisions of the Canadian Environmental Protection Act, 1999 (CEPA).⁸ This paper describes the goals Canada established as a signatory to the G7 Charter, including working with industry (and in some cases other levels of government) towards:

- 100% reusable, recyclable, or, where viable alternatives do not exist, recoverable, plastics by 2030;
- Increasing recycled content by at least 50% in plastic products where applicable by 2030;
- Reuse and/or recycle at least 55% of plastic packaging by 2030 and recover 100% of all plastics by 2040; and
- Reducing the use of microbeads in personal care products and addressing other sources of microplastics (since this announcement the use of plastic microbeads in personal care products has been banned in Canada).

Several provinces in Canada (Ontario, British Columbia, Saskatchewan, Manitoba, Quebec) have EPR programs for packaging in place, with Alberta and the Atlantic provinces considering EPR for packaging. The CCME published its Zero Plastic Waste Action Plan commits to, among other things, creating a harmonized approach to EPR throughout Canada.⁹

Response of Brands and Other Stakeholders

Given these marketplace pressures as well as concern for plastics’ impact on the environment, many consumer packaged goods brands (particularly global companies also subject to the often more stringent packaging policies of other countries) have made bold commitments regarding packaging sustainability – as individual companies and as participants in broader multi-stakeholder initiatives. Key multi-stakeholder initiatives and associated brand commitments are described below.

Voluntary Initiatives

The **Ellen MacArthur Foundation** has been crucial in organizing stakeholders and developing a framework for bringing about the circular economy. In October 2018, in collaboration with the UN Environment Programme (UNEP), the New Plastics Economy Global Commitment was launched. More than 450 organizations signed on, including companies representing 20% of the plastic packaging created globally. The New Plastics Economy is one in which plastic never becomes waste. This is to be achieved by 1) eliminating plastics that are not needed; 2) innovating to ensure that the plastics we do need are recyclable, compostable or reusable; and 3) circulate to ensure plastics are kept in the system – no landfilled or leaked into the environment. Many global brands made commitments through the **New Plastics Economy** to reduce the amount of packaging they use; to ensure that the plastic packaging they put in the marketplace is reusable, recyclable, or compostable; and to increase the amount of recycled content in their packaging,

⁸ Environment and Climate Change Canada, [A Proposed Integrated Waste Management Approach to Plastic Products to Prevent Waste and Pollution](#).

⁹ Canadian Council of Ministers of the Environment (CCME), [Canada-Wide Action Plan on Zero Plastic Waste: Phase 1](#), 2019.

with 2025 being a key target year to achieve these transformational goals. Related to the New Plastics Economy is formation of nine multi-stakeholder Plastics Pacts that have formed in various countries/regions throughout the world.

The U.S. Plastics Pact launched in August 2020 to bring together diverse public-private stakeholders across the plastics value chain to reconsider the way we plastic are designed, used, and reused in order to come closer to creating a circular economy for plastic in the United States. The collaborative is led by The Recycling Partnership and World Wildlife Fund (WWF), and is part of the Ellen MacArthur Foundation’s global Plastics Pact network.

To date more than 70 “activators” – including for-profit companies, government agencies, and NGOs – have joined the U.S. Plastics Pact, representing each part of the supply and plastics

manufacturing chain. Activators agree to collectively deliver these four targets:

Figure 4: Activators of the U.S. Plastics Pact



1) Define a list of packaging to be designated as problematic or unnecessary by 2021 and take measures to eliminate them by 2025.

2) By 2025, all plastic packaging is 100% reusable, recyclable, or compostable.

3) By 2025, undertake ambitious actions to effectively recycle or compost 50% of plastic packaging.

4) By 2025, the average recycled content or responsibly sourced bio-based content in plastic packaging will be 30%.

It is widely accepted that bringing about the U.S. Plastic Pact’s vision will require new levels of innovation and

Source: <https://usplasticspact.org/about/>, accessed November 11, 2020.

collaboration from all Activators of the U.S. Plastics Pact and beyond. The U.S. Plastics Pact is voluntary in nature, but the process includes transparency in reporting. Further, the Plastics Pact envisions creating consensus to drive policy that supports the circular economy.

A plastic pact is under development in Canada as well and is expected to launch before the end of 2020.

In Canada five companies in the food, beverage and packaging sector have joined forces to create the Circular Plastics Taskforce_(Groupe d’action plastiques circulaires, or GAPC) in partnership with the Chemistry Industry Association of Canada’s (CIAC) Plastics Division (formerly the Canadian Plastics Industry Association) to develop a circular economy for plastics in Canada. The organization, founded in February 2020, is also supported by Environment and Climate

Change Canada and Éco Entreprises Québec serves on the project as a consultant and financial partner. The group is working to recycle all types of plastics, ideally, locally, developing a strong recycled resin market in Quebec, and then throughout Canada, by completing the following project phases:

- Phase I – Map the recycling value chain and determine the different needs for different markets (November 2019 – December 2020);
- Phase II – Conduct pilot projects in sorting and processing facilities to test innovative solutions, developing best practices (Beginning January 2021); and
- Phase III – Replicate projects outside of Quebec.

The Recycling Partnership (TRP) Film and Flexibles Coalition is comprised of 14 member brands, retailers, trade associations and packaging converters working to define, pilot and scale recycling solutions for film and flexible plastic packaging. The Coalition’s current focus is on gathering data to document generation by various sources and the performance results for various collection methods. The Coalition has an interest in performing additional field research and developing pilot programs to better determine the results that can be obtained via different system approaches, however these activities are currently on hold due to Covid-19 safety concerns.

Initiatives to Drive Policy Action

As the above groups (and others) continue to work on advancing packaging recycling in the U.S. on a voluntary basis, it has become widely recognized that voluntary initiatives will be insufficient to bring about the necessary changes in the recycling system to recover and process the amount of plastic packaging that will need to be recycled and supply sufficient postconsumer resin (PCR) needed to meet recycled content goals and requirements. Consequently, industry thinking has shifted from seeing policies as threats to avoid, to seeing policy as necessary and beneficial to collectively move the circular economy forward and establish a level playing field for all companies. Policy mechanisms will be needed to drive action as well as generate the funding needed to support infrastructure development and expansion as well as promotion and incentives to increase recycling behavior. With this recognition, several industry groups are coming forward with policy proposals of their own, passage of which they are willing to actively advocate for. These groups include but are not limited to:

- Consumer Brands Association
- TRP Circular Economy Accelerator
- AMERIPEN
- American Chemistry Council
- Flexible Packaging Association

The **Consumer Brands Association** (CBA) released its position paper¹⁰ outlining CBA’s “recommended approach to achieving America’s recycling future and creating the system the U.S. needs.” Specific funding mechanisms have not been proposed yet, but CBA states that “fixing and

¹⁰ Consumer Brands Association, “[Achieving America’s Recycling Future](#),” April 2020.

strengthening the recycling system is a shared responsibility” and that “the CPG industry is open to a variety of dedicated funding options, provided the funding goes exclusively to a clearly defined, long-term solution that includes standardization.”

CBA has created a multi-stakeholder Recycling Leadership Council whose policy focus is on:

- Data collection and standardization,
- Standardization and harmonization throughout the entire U.S. recycling system, and
- Financing recycling system improvements as well as end market development.

The Recycling Partnership (TRP) established the Circular Economy Accelerator initiative for the purpose of “bringing together forward-thinking public and private partners to pursue policy solutions that create a more circular economy.” Their September 2020 report, “Accelerating Recycling” calls for eco-modulated fees borne by brand owners which would help develop the recycling infrastructure and education programs, paired with disposal fees, ultimately passed on to generators of waste, to help pay for ongoing recycling costs.¹¹ TRP is convening the Pathway to Circularity Industry Council which includes representatives from more than 30 businesses and industry organizations representing all materials types and key stakeholders to set standards and identify steps to achieve circularity and true recyclability.

AMERIPEN also released a position statement, “Advancing Packaging Recycling”¹² outlining financing principles and objectives for advancing packaging recycling in the U.S. AMERIPEN “recognizes the need for the packaging value chain to help identify options to finance packaging recovery and what role all stakeholders, including industry, should pay.” The Association is in favor of some type of industry funding. At the time of this writing, AMERIPEN was close to releasing more-specific funding policy recommendations.

The **American Chemistry Council** (ACC) released its “Roadmap to Reuse,”¹³ which supports PAYT, in which generators pay for waste management based on the quantity of waste disposed, while recycling is incentivized by being provided at no extra charge and the development of “incentives and penalties” for packaging attributes. On a broader scale, the ACC has established two ambitious goals: that 100% of U.S. plastic packaging will be recyclable or recoverable by 2030, and that 100% of U.S. plastic packaging will be reused, recycled or recovered by 2040, along with six principles to accelerate the elimination of plastic waste through the circular economy (see text box).¹⁴ The ACC documents describe roles for resin producers, brands/retailers, haulers/MRFs, reclaimers,

ACC Principles for Eliminating Plastic Waste Through the Circular Economy

- 1) Support policy and legislation supporting the circular economy.
- 2) Minimize plastic waste through recycling.
- 3) Advance the circular economy in the manufacturing of plastic products.
- 4) Support a national recycling framework.
- 5) Support markets for recycled content.
- 6) Promote the circular economy.

¹¹ The Recycling Partnership, [Accelerating Recycling: Policy to Unlock the Circular Economy](#), 2020.

¹² AMERIPEN, “[Advancing Packaging Recycling: Financing Principles and Objectives for Advancing Packaging Recycling in the U.S.](#),” May 2020.

¹³ American Chemistry Council, [Roadmap to Reuse](#), 2020.

¹⁴ American Chemistry Council, [Principles for Eliminating Plastic Waste through a Circular Economy](#), 2020.

industry groups and governments. The policies they suggest also include packaging fees to support the development of recycling education and recycling infrastructure, as well as disposal fees to put recycling and disposal on more equal footing and PAYT to incentivize recycling.

The **Flexible Packaging Association** (FPA) teamed with the Product Stewardship Institute to lead a multi-stakeholder dialogue process spanning several months in 2019 and 2020 for the purpose of:

- Building collective understanding of the benefits of flexible packaging;
- Agreeing on a problem statement regarding the end of life management for flexible packaging;
- Agreeing on the effective attributes of an end of life management system for flexible packaging;
- Reaching consensus on key concepts for any state or federal EPR legislation.

Stakeholders included municipalities, haulers, processors, environmental groups, converters, brands and retailers. The dialogue has helped FPA shape its EPR policy position in a manner that reflects understanding of other stakeholders' perspectives and FPA member support for policy that leads to developing a model system that incentivizes reduction in material use and environmental impacts, maximizes collection and environmentally beneficial post-consumer management of flexible packaging in the U.S.; and minimizes cost to government and industry.

Implications Going Forward

Some brands and organizations are supportive of certain policies but generally prefer a national approach versus a state-by-state patchwork of policies which would likely be logistically challenging to incorporate into business practices. There is broad consensus that industry funding is needed to enhance both recycling infrastructure and communications about plastics recycling but there appears to be little support for industry funding to cover day-to-day recycling operations.

This is different than the policy approach in most Canadian provinces where industry completely funds (and in British Columbia where it also operates) residential recycling operations. Ontario is now converting to a full producer responsibility system (from a shared responsibility approach) As described by Philippe Cantin, Senior Director of Sustainability Innovation and Circular Economy for the Retail Council of Canada, having direct control over recycling program operations provides the obligated industry parties the opportunity to design, build and operate the recycling system industry feels is most appropriate to meet the system's performance goals and to handle the full range of packaging types deemed appropriate. This may not be what occurs when local governments and their contractors are responsible for recycling program operations as local government and industry goals are not always the same. Time will tell what policies actually are enacted and what therefore results, but the following can be stated with a fair degree of certainty:

- Brand commitments as well as state, provincial, and possibly federal policy mechanisms will drive greater demand for recyclable plastic packaging as well as incorporation of recycled content in plastic packaging.
- Policies requiring industry involvement in funding certain aspects of the U.S. recycling system are coming and will result in significant investments in improving the U.S. recycling system.

- Corporate actions and governmental policies will be implemented in both the U.S. and Canada (as is the case in Europe) to limit the production and use of unnecessary plastic packaging especially that which is non-recyclable/compostable.

So what does all of this mean for flexible plastic packaging?

- End market demand for recovered plastics will continue to improve;
- While many brands are currently achieving their recycling and/or recycled content packaging goals through use of rPET and other rigid plastics, over time FPP (or at least non-food contact layers of FPP) will increasingly be expected to be recyclable (or, in some cases, compostable) and to contain recycled content. Food contact recycled content will be increasingly possible via chemical recycling; and
- Flexible plastic packaging that is not recyclable/compostable and considered unnecessary will be targeted for reduction – by law and/or brand and consumer preference.

Recycling Options

The Association of Plastic Recyclers (APR) defines an item as “recyclable” when the following three conditions are met:

- 1) At least 60% of consumers or communities have access to a collection system that accepts the item;
- 2) The item is most likely sorted correctly into a market-ready bale of a particular plastic meeting industry standard specifications, through commonly used material recovery systems, including single-stream and dual stream material recovery facilities (MRFs), PRFs, systems that handle deposit system containers, grocery store rigid plastic and film collection systems; and
- 3) The item can be further processed through a typical recycling process cost effectively into a postconsumer plastic feedstock suitable for use in identifiable new products.

The Ellen MacArthur Foundation builds in this definition by stating that “collection, sorting, and recycling of the package happens in practice, at scale, and with reasonable economics.”

In this section we discuss the extent to which recycling system requirements are met for FPP and what is being done to advance FPP recycling.

Curbside Recycling

Curbside recycling is the primary and most convenient means by which consumers recycle in the U.S. and Canada, with 68% of households having access to curbside recycling in the U.S. There is no current comparable data for Canada. FPP poses challenges for curbside recycling because, when empty, these packages are two-dimensional. While easy to collect from households, the vast majority of U.S. MRFs (and some Canadian) that sort recyclables collected via residential curbside recycling programs accept single-stream materials and separate two-dimensional fiber materials from three-dimensional containers. With current mechanical sorting technology, flexible packaging would tend to become mixed in with fiber, devaluing the paper bales and being lost from the flexible packaging bales. In addition, film plastic, which could potentially be collected with FPP, tends to wrap around MRF processing equipment causing downtime and increasing

processing costs. For these reasons, MRFs generally do not accept film/flexible plastic material. Most MRFs and the communities that supply them educate residents NOT to place film and flexible plastic packaging in the recycling bins.

Three different initiatives are underway to address this challenge:

- 1) The **Material Recovery Facility of the Future (MRFF) project** is a collaboration of multiple companies working to explore how FPP can be effectively sorted for recovery. Since September 2019, loose FPP has been collected via curbside recycling in pilot communities in Berks County, PA and taken to the TotalRecycle MRF which has been equipped with additional optical sorters installed and specially calibrated and tested to eject flexible packaging from the two-dimensional fiber stream. The separated FPP is further sorted to remove as much fiber as possible and results in a relatively clean stream of FPP in the form of “rFlex” bales. The bale content is 60% polyolefin (largely retail carry bags, storage bags, shrink bundling and wrap). This polyolefin component is estimated to consist of 54% polyethylene and 6% polypropylene. Multilayer FPP such as standup pouches and chip bags comprise 10% of the bale, and unidentified FPP makes up another 10%. The project was able to repeatedly achieve paper content of less than 15% in the bales and to reduce the amount of FPP ending up in paper bales. However, the capture rate achieved was 74%, falling short of the 90% goal. Also, the study indicates that the cost of sorting the material was higher than its potential market value. The project report also noted that “the supply chains to take rFlex bales and get it washed, ground and processed for a plastics-only market do not now exist in the U.S.”¹⁵ Multiple potential end markets for rFlex bales were also evaluated. Only one end market was identified that could accept the amount of fiber (up to 15%) present in the bales. This market was compression molded roof coverboard and subflooring which is currently manufactured in very limited locations but is a growing market. Additional investigations are underway to identify end markets for the rFlex material.

It is uncertain if this processing system will ultimately be viable in single-stream residential collection due to its high costs and the fact that MRF operators generally see loose flexible packaging as problematic to their operations. Many MRF operators today are working to reduce the types of materials included in their programs, believing that simpler instructions to residents will reduce contamination as well as increase capture of the shorter list of target materials. This trend is counter to the interests of packaging companies seeking to add more packaging types to curbside recycling programs.

- 2) The **HolyGrail project** is exploring two innovative technologies – the use of chemical tracers and digital watermarks to develop “smart packaging.” This three-year project is led by Procter & Gamble and facilitated by the Ellen MacArthur Foundation, with the cooperation of 29 partners. Through these technologies, Digimarc Barcodes, developer of two-dimensional watermark codes versus the one-dimensional bar code used today, are conveying information in the pixels of images on packaging or through embossing in a molded package. This allows for the transmittal of additional data in an effort to ensure accurate sorting of material, as well as conveyance of other information that enhances efficiencies and product traceability throughout the supply chain. Initial study results

¹⁵ Flexible Packaging Recycling in Material Recovery Facilities Pilot – [Research Report May, 2020](#).

indicate that retrofitting existing sorting equipment with add-on modules for detection of chemical tracers or digital watermarks is likely to be less capital intensive than upgrading recycling facilities with more sophisticated detection technology based on material properties.

Major retailers in the U.S. (Wegmans, Walmart) and in Europe are already adopting this form of “smart” or “intelligent” packaging technology in their packaging. The information embedded in the packaging can also inform the consumer about product attributes as well as proper end-of-life management of the package. The digital watermarks could also be used in the manufacturing process and to make retail checkout more efficient. Next steps include getting stakeholders to agree on a common identification scheme in order to make it possible to implement codes as a basis for sorting at scale. HolyGrail 2.0 is now under way to continue the development of digital watermarking through industry trials to commercial sorting and equipment availability. Specifications for sorting equipment will also be developed, as well as specifications and protocols for embedding digital watermarks in molded plastics.

This technology holds promise as a means of improving MRF and secondary plastics recycling facility (PRF) sorting effectiveness but is still under development and not close to commercialization.

- 3) The **Hefty® EnergyBag™ (HEB) program** is a Reynolds Consumer Products and Dow initiative that enables communities to collect hard-to-recycle plastic items (including most forms of FPP) curbside in a separate orange “Hefty® Energy Bag™” Residents place acceptable items in the bags which they purchase from retail outlets such as grocery and building supply stores. When the bag is full, residents tie it closed and place it in their curbside recycling cart/bin along with other recyclable materials. At the MRF, these bags are removed, then baled and shipped to designated end markets arranged by Dow/Reynolds. Current markets include pyrolysis facilities and cement kilns as bridge markets, with many other end markets under investigation. To date this program has operated in Citrus Heights, California (a pilot project that has ended); Cobb County, Georgia; Lincoln, Nebraska; Omaha, Nebraska; Boise, Idaho, and London, Ontario. It is currently serving over 700,000 households and has diverted from disposal over 1 million pounds of hard to recycle plastics (through September 2020).¹⁶

The learnings from these initial community programs are being used to shape the course of future efforts. In addition, a life cycle assessment was recently conducted to develop an understanding of the associated environmental impacts and benefits of this end-of-life management option. With this information in hand, the HEB team is now working to expand the program to more communities with a goal of making the program available to approximately 1.5 million households by the end of 2021, more than double the households with access to the program in 2020.

One challenge to expanding this program is that inclusion of film and flexibles in curbside programs goes counter to longstanding education and outreach to exclude film plastic from recycling bins/carts. However, a key advantage of this collection model is that the MRF investments needed to remove and bale the bagged material are minimal, thereby enabling both small and large MRFs to cost-effectively participate. MRFs essentially just need to have the

¹⁶ Reynolds Consumer Products Director of Marketing, November 4, 2020.

capability to remove intact bags at the front of their processing line and storage space for unbaled and baled material awaiting shipment.

Mail-in Recycling

Mail-in recycling systems for brand-specific pouches are offered by TerraCycle through partnerships with associated brands who subsidize the cost of the program. Consumers sign up to participate, send in packaging using their own box and a shipping label which is supplied by TerraCycle. Participants receive 100 points per pound of material shipped, which can be applied to designated charities. Alternatively, consumers can purchase pre-paid mail envelopes, fill them with specific types of FPP (e.g., baby food pouches) regardless of brand, and mail them to TerraCycle. The pouches collected through both of these programs are recycled into plastic goods. While TerraCycle provides this option for consumers, it would only appeal to highly motivated recyclers using specific brands' products and is therefore not likely to be a prevailing FPP collection and recycling pathway.

Recycling via Store Drop-Off



Source: Image from Target store drop-off

Store drop-off is the predominant means of collecting and recycling post-consumer film plastics in North America. Store drop-off programs were originally established and designed to recycle retail carry out sacks and other clean, dry polyethylene film (such as dry cleaner bags and overwrap). These programs serve end markets that consume PE film specifically. Consequently, the only acceptable FPP for recycling through these programs is PE packaging and that which is predominantly PE with additional approved compatible components as discussed further below. Flexible packaging that is comprised of multiple different material types (e.g., paper, foil, and/or multiple resins) cannot be accepted in store drop-offs and even if recovered have very limited end use applications as discussed above.

To limit consumer confusion regarding which multi-layer FPP (versus single layer packaging such as bread wraps and beverage bottle case overwrap) is acceptable and therefore avoid contamination, brands working with their converters can apply with the SPC for permission to place How2Recycle labels on their PE flexible packaging that meets the SPC's stringent acceptability criteria developed in cooperation with the Association of Plastic Recyclers (APR). If solely PE film, the label can be applied; however more complex multi-layer packaging (such as structures with additives that make them compatible for recycling with PE film) must meet APR's "PE Film Critical Guidance Test Protocol."¹⁷ As APR's Director of Films and Flexible Packaging, Sandi Childs, stated: "The ability to measure compatibility with recycling is vital to keeping a clean stream of materials flowing to recyclers from retail store drop-off bins."



¹⁷ The Association of Plastic Recyclers, "[Critical Guidance Protocol for PE Film and Flexible Packaging](#)," August 31, 2020.

In the U.S. and Canada the Wrap Recycling Action Program (WRAP), supported by the Flexible Film Recycling Group (FFRG) of the American Chemistry Council, provides education and awareness about film plastic recycling, and has a goal of doubling the amount of film plastic recycled. It describes the specific types of film plastics that can be recycled, including those with the How2Recycle label indicating that they can be recycled through a store drop-off program if clean and dry. The largest U.S. retailers use the How2Recycle label for their private label brands and have return-to-retail film plastic recycling programs in place to accept their own brand FPP and other suitable materials. WRAP estimates that there are over 18,000 locations for film plastic recycling throughout the U.S. and Canada, but the actual number is difficult to verify.

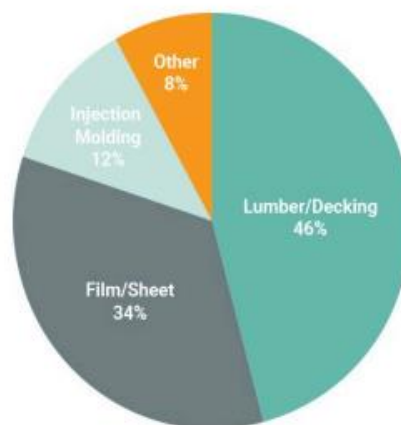
Most American households have access to recycling polyethylene film and How2Recycle-labeled FPP through store drop-offs. However, because these programs lack the convenience of curbside, participation is substantially lower. Currently this is a good thing because the capacity of the store drop-off system is limited – both in terms of the store sites as well as processing and end markets. Store receptacles are generally small and often tucked away inside the stores themselves. They are not suitable for receiving all single-resin FPP now on the market, let alone what might be generated if substantially more brands begin to use this type of packaging and promote its recycling.

With respect to Canada, a pilot project was implemented in British Columbia in June 2018 to collect “Other Flexible Packaging” through Recycle BC depots (drop-off centers) and London Drugs locations throughout the province. The project aims to develop recycling markets with their partner, Merlin Plastics, while using collected material, in the interim, to manufacture engineered fuel (seen as “recovery,” not “recycling”). Other Flexible Packaging includes:

- Stand-up and zipper lock pouches,
- Crinkly wrappers and bags,
- Flexible packaging with plastic seal,
- Woven and net plastic bags, and
- Non-food protective packaging.

To date, the material is still being processed to make engineered fuel, with the long-term goal of transitioning to recycling markets as technology advances and such opportunities arise.

Figure 5: Reclaimed U.S. Post Consumer Film 2018 End Uses by U.S. and Canadian Reclaimers



Source: More Recycling for ACC, “2018 National Postconsumer Plastic Bag and Film Recycling Report, August 2020.

More on Reclamation and End Use

Traditional (“Mechanical”) Recycling

Plastics recycling consultant More Recycling estimates that there was 1.2 billion pounds of film plastic reclamation capacity in the U.S. in 2018. In that same year, approximately 1 billion pounds of plastic film were recycled.¹⁸ If single-resin pouches were to be recycled in the U.S., additional capacity would be needed. Some flexible packaging used for food and other products may contain remnants of the product, requiring the material to be washed during the recycling process. There is currently not an abundance of wash lines in film plastic recycling facilities – more washing systems are needed.

There is also a limit on end markets for recovered flexible PE packaging. Primary markets for recycled PE film are composite lumber and recycled films or sheets. While there are other end users of secondary film plastics many only consume film from non-residential sources because the quality is higher and more consistent. APR and SPC representatives interviewed for this White Paper are not aware of instances where store drop-off material bales were rejected by end users due to inclusion of FPP, however concerns have been raised by some end markets that consumers may not always differentiate between acceptable PE packaging and non-acceptable forms of FPP. Consumer education in this regard will therefore be very important.

In 2016 the ACC and the U.S. Environmental Protection Agency (EPA) signed a memorandum of agreement to increase PE film recycling, with a goal of recycling 2 billion pounds annually by 2020 (relative to the 1 billion pounds recycled in 2017). Clearly the goal was not met. However, to support that goal, the Plastics Industry Association (PIA) launched its NEMO (New End Market Opportunities) PE film project in early 2017 to identify opportunities and applications for recycled PE film. The project has conducted research to identify potential end markets and test processing and production. One end market that seems plausible is using post-consumer recycled PE films as polymer additives in asphalt binder. In conjunction with the National Center for Asphalt Technology (NCAT), the project team developed a formulation using the recycled PE that is comparable in most performance tests to that of traditional, virgin polymers used in some modified grades of asphalt today. The formulation could reduce the cost of polymer modified asphalt and reduce associated CO₂ emissions, thus improving the performance, environmental impact, and lifespan of asphalt applications. Several companies have volunteered to test the formulation in privately funded projects scheduled to be installed in 2020.

Mechanical sorting and reclamation has been the predominant means of recycling plastic back into plastic resins that can be used to make new plastic products, but this approach to plastic recycling has limitations. In addition to those discussed above, recovered material quality ultimately deteriorates, thereby limiting potential subsequent recycling. In addition, the need to sort most plastics by resin type to meet the specifications of mechanical recycling end users limits mechanical recycling of multi-material multi-layer packaging, which includes most of the FPP on the market today.

¹⁸ More Recycling for American Chemistry Council, 2018 National Postconsumer Plastic Bag and Film Recycling Report, August 2020.

Chemical Recycling

Growing interest in building a circular economy and keeping all plastics in the resource stream and out of the environment, paired with recognition of the limitations of mechanical recycling has prompted several companies to make substantial investments in developing “chemical recycling” technologies and opportunities. These proprietary technologies (also called advanced recycling, feedstock recycling, and in the case of plastics-to-plastics, molecular recycling) are all unique, but in general have the ability to convert plastics to chemicals for use as fuels, waxes, and/or feedstock making new plastics. Plastic-to-plastic technologies reportedly break plastics down into their original building blocks allowing them to be purified and repolymerized, resulting in chemically recycled plastics that have the same quality as virgin plastics. Developers of these technologies generally claim that they do not want to infringe on mechanical recycling but wish to complement mechanical recycling – creating a recycling alternative for plastics that cannot currently be mechanically recycled, either for technical or cost-effectiveness reasons.

Technologies for chemical recycling can be divided into chemical depolymerization, pyrolysis, and gasification technologies. Facilities using each of these technologies are already operational and accepting post-consumer plastics in the U.S. Green Mantra in Ontario uses pyrolysis of clean separated resin streams to produce waxes and other specialty additives, which is considered recycling. Pyrolysis is best suited to handle a mixture of polyethylene, polypropylene, and polystyrene, whereas gasification can accept a more extensive range of plastic types. Chemical depolymerization requires plastics to be sorted first by resin type – e.g., only PET. The technologies all desire that halogenated compounds such as PVC and flame-retardant plastics be disposed or mechanically recycled and not included in their processes. While companies using pyrolysis today are focused mostly on producing fuels, chemical companies hope that more firms will use the process to make products that can be fed into petrochemical plants and become plastics again. Commercialization of plastics-to-plastics molecular recycling technologies is somewhat of a “chicken and egg” scenario. Some facilities are operating but need to obtain sufficient suitable quality feedstocks to operate at a commercial scale, while public and private recycling collection programs are reluctant to expand the list of plastic collected until more commercial scale facilities exist.

As stated earlier, the use of plastics as fuels or energy is seen as a less desirable recovery option for FPP, as the ability to continuously re-use materials is eliminated when material is burned. However, there is still a place for these outputs in bridging the gap for flexible packaging recovery, as a replacement for virgin inputs and until plastics-to-plastics markets are scaled up.

While development of chemical recycling has significant support and financial backing from numerous corporate and government interests, opportunities are still emerging. It will likely be at least five years before the technologies are considered proven, economically viable, and are commercially widespread, after which collection and sorting of plastics for chemical recycling could begin to expand throughout North America. The time it may take to create the system for the target plastics to be widely collected could take another five years. For comparison, it took the Carton Council eight years to grow cartons recycling access from 18% to over 60%, after which cartons could be labeled “recyclable” without qualification.

Consequently, companies wishing to meet recyclability goals for their flexible packaging by 2025 (the target date for goals set by the U.S. Plastic Pact and companies participating in the Ellen MacArthur Foundation’s New Plastics Economy Global Commitment) recognize the need to focus

on advancing mechanical recycling innovations and associated collection and processing systems plus designing flexible packaging to ensure that it can be mechanically recycled.

Importance of Design for Recycling

Recyclability

To say that an item is recyclable implies that it can be both technically and practically recycled – meaning there is a collection and processing infrastructure in place and ultimately one or more end markets into which the item will be remanufactured into a new package or good. The Ellen MacArthur Foundation definition of recyclable includes the requirement that it is proven to work in practice, at scale and with reasonable economics. In the U.S., the Federal Trade Commission (FTC) also places restrictions on what packaging can be labeled as “recyclable.” In order for a package to be labeled with an unqualified “recyclable” label, per the FTC’s Green Guides¹⁹:

- Recycling facilities must be available to a substantial majority (at least 60%) of consumers or communities where the item is sold.
- The entire product or package, excluding minor incidental components, must be recyclable.

Qualifying statements/explanations are required on “recyclable” claims if:

- Recycling facilities are not available to a substantial majority of consumers or communities where the item is sold. [Example #1: This product (package) may not be recyclable in your area. Example 2: This product (package) is recyclable only in the few communities that have appropriate recycling facilities.”]
- A product/package is partially made of recyclable components [The product/package should clearly and prominently qualify the recyclable claim to avoid deception about which portions are recyclable.]

The How2Recycle label applies a threshold of 20% recycling collection access, below which a package would be labeled as “not yet recyclable.”

In Canada the Bureau of Competition/Bureau of Standards Guidelines for Environmental Claims²⁰ indicates that it is not enough to confirm that there are municipal or industry collection systems where the product is sold in order to make a claim of “recyclable” – there must also be facilities to process the collected materials and reuse them as an input to another product that can be marketed and used.

Also per the Canadian Guide, qualifications must be made if collection or drop-off facilities for the purpose of recycling the product or packaging are not conveniently available to a reasonable proportion of purchasers, potential purchasers, and users of the product in the area where the product is sold. The qualified claim must adequately convey the limited availability of collection facilities. If packaging is not recyclable in all cities, the guide encourages detailed specifications.

¹⁹ Federal Register / Vol. 77, No. 197 / Thursday, October 11, 2012 / Rules and Regulations p. [62129 – 62130](#).

²⁰ Competition Bureau of Canada and Canadian Standards Association, Environmental claims: [A Guide for Industry and Advertisers](#), page 42.

[Example: “This container is recyclable through the blue box program in Southern Ontario and at recycling depots in Winnipeg and Edmonton” is preferable to “recyclable where facilities exist.”]

Recycle-Ready versus Recyclable

The term “RecycleReady” was coined by Dow to describe Dow’s portfolio of resins, adhesives, and compatibilizers that, as stated on the Dow website, can be used by packaging manufacturers to “produce sustainable, recyclable packaging – a way to create flexible packaging that can be easily recycled through existing polyethylene (PE) film recycle streams, such as grocery store drop-off programs in the United States and Canada.” Others in the industry began using this term for the packaging they manufacture or use in packaging the products they sell that meet store drop-off acceptability criteria. From the perspective of these stakeholders, recycle-ready means that the package was designed to be suitable for mechanical recycling, but that actual recyclability depends on the package not being modified by any problematic adhesives, labels or other components that would be contaminants to the recycling system, and that consumers have access to recycling opportunities and do their part to make sure the packaging is clean and dry before putting it in the recycling bin.

While the majority of households in North America have access to store drop-off locations, given the limited capacity of store drop-offs to handle additional film/flexible packaging materials, this system is regarded as a stop-gap measure to provide a recycling option until a long-term solution is developed. All parties interviewed for this article believe that some form of curbside collection will be essential – both for meeting recyclability definitions and to result in flexible packaging actually being recycled. The North American system will likely evolve into a two-pronged recycling system where recycle-ready FPP is mechanically recycled (typically lower cost and more resource efficient) and some FPP – particularly that which isn’t suited for conversion to single-resin formats — is chemically recycled. Some system differences may also be necessary due to different constraints in rural versus urban areas. On-package labeling and other forms of consumer education will be an important part of this system to assure materials are properly set out for recycling and potentially smart labeling to enable more cost-effective sorting. However, as shared by a retailer interviewed for this White Paper, the ideal scenario would be for all packaging in the market to be recyclable so that labeling to identify what is or is not recyclable wouldn’t be necessary.

The ability to establish and implement this type of flexible packaging recycling infrastructure throughout North America evokes the “chicken and egg” scenario, as the material must be present as a recoverable feedstock to warrant establishment of recycling infrastructure and end markets, but the incentive to develop recycle-ready packaging may not be present until the more comprehensive recycling system is in place. Packaging manufacturers that develop recycle-ready packaging are contributing these “eggs,” which in turn helps spur development of the collection and processing infrastructure and end markets needed. *But this is only the case if their customers purchase the recycle-ready packaging and encourage consumers to recycle it via use of the How2Recycle label and other forms of consumer education.*

Collaboration – Essential for Success

As is the case in bringing any new product to market, manufacturers and users of recycle-ready FPP take a business risk and may incur higher costs in doing so. Designing recycle-ready packaging requires significant research and development and performance testing by packaging

manufacturers and their suppliers. The different layers in a multi-material flexible package each served a unique function, such as providing moisture, aroma, and gas barriers or flexibility or stiffness. Creating a recycle-ready package that can serve that same role may require innovation, use of more material and the use of additives or compatibilizers. While the aim may be for drop in technology with no required changes in equipment or process, tests must be run on filling equipment and some modifications may need to be made particularly if replacing packaging already in use. For these reasons, use of recycle-ready packaging in new applications can be easier than substitution in existing applications. Companies that make and/or use recycle-ready FPP in applications where this is feasible are supporting development of the widest possible opportunities for flexible plastic packaging recycling. As businesses increasingly focus on the triple bottom line, adopting the use of more environmentally friendly packaging, such as recycle-ready FPP, is regarded as just part of being a responsible business.

In either circumstance, the best business opportunity exists when all value chain players venture down this path together and employ a holistic, systems approach, for no one value chain partner can singlehandedly provide the solution. These critical players include:

- **Film manufacturers** – who understand best the performance properties of their products in various applications;
- **Suppliers of closures** such as zippers and spouts – whose products must also be compatible with recyclability criteria and perform according to specifications;
- **Packaging converters** – who need to meet recyclability technical criteria as well as customer performance expectations (safety and security being paramount);
- **Machinery suppliers** – who may need to modify existing or supply new equipment to accommodate the new packaging's physical properties;
- **CPG brands**, including sustainability, procurement, technical and marketing personnel – who introduce the packaging into the marketplace and are accountable for achieving company sustainability goals as well as meet consumer preference and regulatory requirements; and
- **Certifiers of recyclability** – who work with brands seeking on-pack labeling such as the SPC's How2Recycle labeling program, and APR.

Ideally brands will lead such collaboration initiatives as it is their purchasing preferences that drive supplier offerings. It is typically brands with 2025-2030 goals plus smaller niche companies that want their brands to appeal to consumers who value sustainable and recyclable packaging that have been doing so. But some packaging converters are also stepping forward to introduce recycle-ready packaging, recognizing the market demand for this type of packaging is rapidly growing. Both brands and their packaging suppliers that are not stepping forward may find themselves losing market share, given the market drivers discussed above. Hence while there is a cost to stepping forward, the risk and cost of not doing so may well be greater.

Building the System of the Future

Looking forward, development of recycle-ready FPP plays an important role in maximizing opportunities for recycling FPP. While efforts should be made to design for recyclability across all applications, not all FPP applications are suited for use of recycle-ready packaging formats compatible with today's mechanical recycling options. It is becoming increasingly imperative that

all packaging put forth in the market be compatible with some form of sustainable end-of-life management option that keeps these packages out of the waste stream and in the resource stream to support circular economy development. Towards this end, increasing amounts of recovered plastic also need to be used in making new FPP.

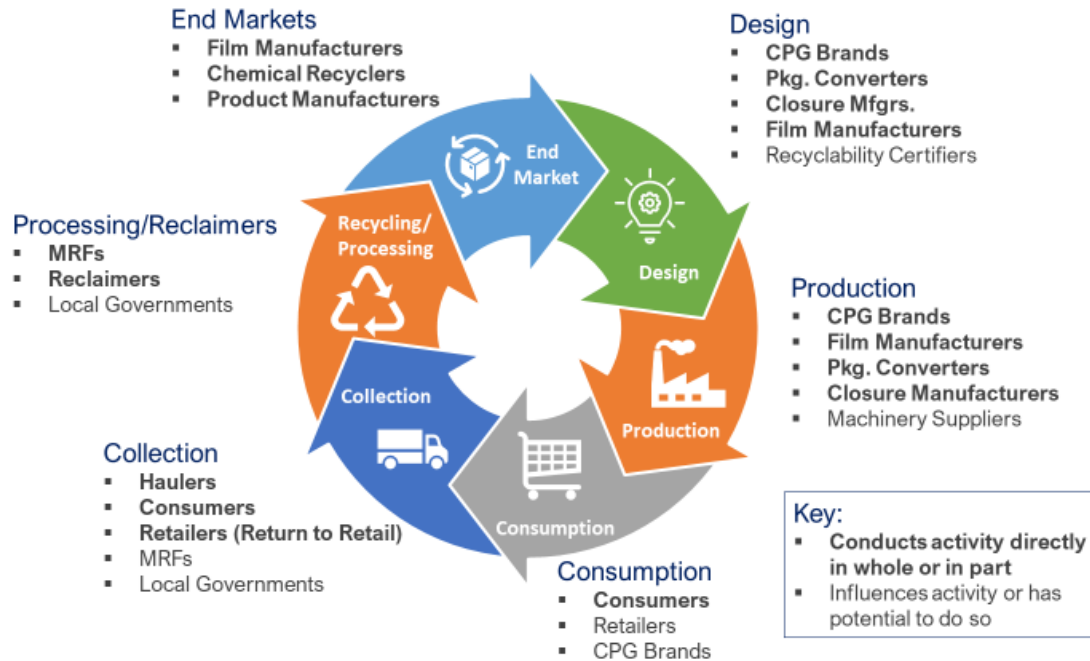
Building the recycling system of the future for FPP starts with identifying end market opportunities and their feedstock specification requirements, then designing packaging that can meet these specifications – whether via mechanical or chemical recycling pathways, followed by establishing the appropriate collection and processing infrastructure to move packaging from point-of-generation into those markets that can accept them.

Critically important to successfully building this system are:

- Commitment from all value chain stakeholders – large, small and in between – to do their part in supporting the system’s development and use (see Figure 6);
- Recognition that FPP recovery and processing need to be integrated with the recovery and processing of other post-consumer packaging types and therefore must be compatible with and not disruptive to the multi-materials recycling system;
- Providing consumers with convenient opportunities to participate in supplying their used packaging for recycling with minimal confusion regarding how to do so and knowledge and incentives to motivate them to do so.

When asked to describe the system of the future, no one interviewed for this White Paper had a clear vision for what the future system would entail although many had ideas regarding various system components and key requirements. There was a consensus among those interviewed that a strategic, systems approach involving representation from all key stakeholders is needed to determine the future system to be built and the specific action steps needed to transition from the current to desired future state. There was also general recognition that this process needs to be fast tracked if companies and organizations are going to meet their 2025 goals and commitments. Figure 6 shows participants in the FPP recycling system value chain – including those that can be system activators – those who directly participate in a system activity, and influencers – those who can directly influence those activities. It is recognized that governments can also influence any activity in the system via policy making, funding and facilitation.

Figure 6: Participants in the FPP Recycling System Stakeholders



Key questions needing answers and subsequent action are:

- Who will lead the system design and strategy development process?
- What will be the process for stakeholder involvement?
- How will the system transformation be funded?
- What policies will be advantageous for incentivizing desired behaviors on the part of value chain players and consumers that will be collectively supported?

It is the authors' hope, as well as Winpak's, that this White Paper serves to foster understanding and alignment towards developing sustainable end-of-life solutions for flexible plastic packaging in the short term and to build the system of the future. Challenges will be encountered along the way, but commitment to overcoming them and ongoing innovation will lead to success.

Susan Bush and Betsy Dorn are Principals with Circular Matters LLC, providing sustainable materials management and circular economy consulting services throughout North America.