

# PLASTICS MARKET WATCH

A SERIES ON ECONOMIC-DEMOGRAPHIC-CONSUMER &  
TECHNOLOGY TRENDS IN SPECIFIC PLASTICS END MARKETS  
FALL 2015 | ISSUE III

WATCHING:

## Packaging



## Plastics Packaging Wraps It Up

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Special thanks to the following SPI groups and committees for their guidance and input on this Plastics Packaging Report:

- SPI Plastics Market Watch work group
- Bioplastics Division
- Food, Drug and Cosmetic Packaging Materials Committee
- Recycling Committee
- Rigid Plastics Packaging Group

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**SPI:** The Plastics Industry Trade Association publishes a series of unique Market Watch reports that explore key factors—including demographics, economics, policy, culture and technology—that impact the plastics industry’s primary end markets. *Plastics Market Watch: Plastics Packaging Wraps it Up* is the organization’s first market assessment report on packaging. Previous Market Watch reports focused on *Plastics in Automotive & Transportation* and *Plastics in Healthcare & Medical Devices*. The next report will focus on *Plastics in Building & Construction*.

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# Foreword

As we continue to look for ways to better serve our SPI membership and the broader plastics industry supply chain, one area of continued discussion is the impact of consumers on our businesses. A variety of factors impact the way that we make our products, how they are consumed and how successful our industry will continue to be.

With this as a backdrop, SPI is producing a unique report series that will explore key factors—including demographics, economics, and technology—that impact the plastic industry’s key end markets. The first report about the Plastics Revolution in Transportation

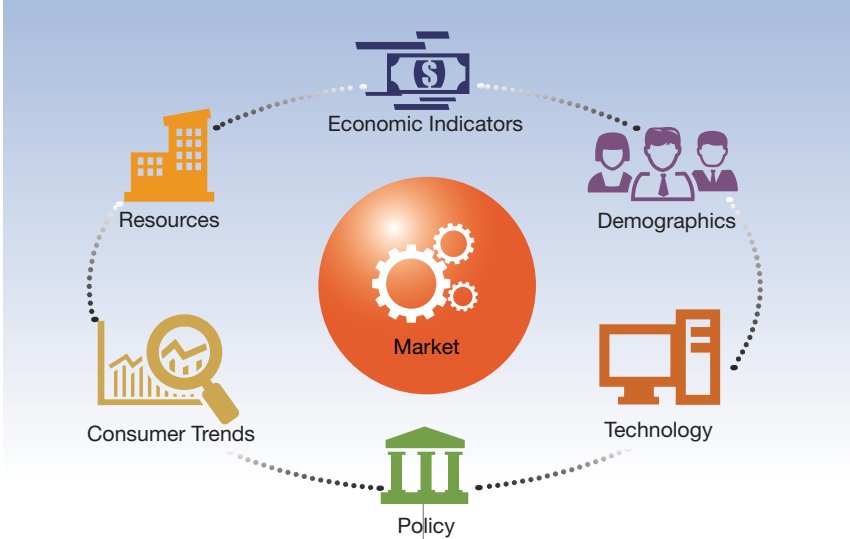
was primarily, but not limited to, cars and trucks. The second report was about Plastics in Healthcare & Medical Devices. This report is devoted to Plastics in Packaging. One more report to be issued early next year will be focused on Plastics in Building & Construction.

Our goal is to publish forward-looking reports for our members and the industry that blend economic data and demographic data to paint an accurate picture of where we are headed in these critical markets. Where it is relevant, we will weave in other factors such as public policy, technology trends, and resource issues. These reports can then be used to present information on key drivers back to

company personnel as input for their own strategic planning activities.

We plan to conduct presentations and webinars in conjunction with each report to discuss our findings, and hope that these will provide important food for thought, whether you are an equipment manufacturer, materials supplier, processor, recycler or brand owner. As always, we welcome your feedback.

### Key Drivers for End Markets





# Plastics Packaging Wraps it Up







# The World of Plastics Packaging

When the packaging design challenges are difficult, plastics are often the answer, sometimes the only answer, performing a set of tasks no other material can handle and providing consumers and businesses with products and services no other packaging substitute can meet as efficiently or safely.

We live in a world where plastic packaging is ever present in our daily lives—in the food we eat, the products we buy at the store or have delivered to our homes, the newspapers that come to our front steps, the medicines and medical devices we need for our health and well-being.

By the 1950s, plastics were becoming the packaging material of choice edging out most standard uses of metal, glass and paper. Today, plastic is the dominant choice for virtually all packaging and packaging is, according to the American Chemistry Council, “the largest market for plastic resins.” When the packaging design challenges are difficult, plastics are often the answer, sometimes the only answer, performing a set of tasks no other material can handle and providing consumers and businesses with products and services no other packaging substitute can meet as efficiently or safely.

Plastic's Share of the Packaging Market	
Substrate	CAGR 2011–2016
Flexible packaging	4.8
<b>Flexible plastic packaging</b>	<b>5.4</b>
Flexible foil packaging	3.3
Flexible paper packaging	3.4
<b>Rigid plastic packaging</b>	<b>5.7</b>
Board packaging	2.9
Metal packaging	1.9
Glass packaging	2.7
Other packaging	(0.4)
<b>Total</b>	<b>3.6</b>

Source: Pira International Ltd.

Different plastics offer different qualities, giving manufacturers and consumers the freedom to choose the type of plastic that best suits a particular application. Plastics can be rigid when protection is needed or flexible when convenience is the emphasis. They can be clear or opaque and can be molded in an array of sizes. They can be made into any color and are excellent for labeling and branding purposes. Among the key qualities that distinguish plastic packaging:

- Durable—the long polymer chains that constitute the raw material of plastics make it extraordinarily difficult to break.

- Improve food preservation—plastics packaging is ideal for the packaging of food items. The materials used, both plastics raw materials and additives, fulfill all food safety legislative requirements at national and global levels. Plastics packaging can be produced and used with tamper-evident and child resistant closures. The transparency of the pack enables users to examine the condition of the goods prior to purchase. A major quality of plastic packaging in food is the prevention of waste. “Wasted food also adds up to wasted water, fuel, and other resources used to produce and transport it,” said celebrity chef Duff Goldman, quoted in *The SPI Magazine* last spring. “So when you think about it, it’s easy to see why food waste is a big problem.” The problem would be much worse without plastic packaging
- Safe—break-resistant, shatterproof and no-spill plastic bottles cut down on injuries and cleanups anywhere the floor may be hard and slippery. Plastic packaging for shampoos, harsh chemicals and motor oils make at-home tasks easier and less hazardous. Child-resistant plastic closures and leak proof plastic containers for medicines and chemicals provide safety for tots and peace of mind for parents, while tamper proof closures and shrink-wrap bands made of plastic protect consumers from tampering.
- Light weight—plastics packaging items are low in weight but high in strength. Thus, products packed in plastics are easy to lift and handle by consumers and by personnel in the distribution chain and reduce shipping costs.
- Design freedom—the properties of the materials combined with the array of processing technologies employed in the industry, ranging from injection and blow molding to thermoforming, enable the production of an infinite number of pack shapes and configurations. In addition, the extensive range of coloring possibilities and the ease of printing and decoration facilitate brand identification and information for the consumer.
- Adaptable—plastic packaging molds itself to modern lifestyles. Today’s working parents and busy homes rely on its convenience and the service it provides. Plastic packaging also preserves flavor and saves time in conventional cooking and storage. Squeeze bottles for condiments, boil-in-bag dishes, resealable bags for everything from shredded cheese to cereal, freezer bags that protect food against ice crystals, and precooked foods that are microwavable in the package all contribute to quality meals in the home.
- Enhance medical safety and effectiveness—plastic packaging offers a superior ability to protect devices against contamination and hence patients against infection. The chemical resistance, transparency and toughness of plastics enhance safety and efficiency in both the laboratory and day-to-day hospital use. “The evolution of new diseases and increasing health awareness is driving demands from end users and health providers for sterile packaging,” says Michael Taylor, SPI Vice President for International Affairs and Trade. “Hospital-acquired infections have drawn a lot of attention to barrier packaging and packaging designed with peelable sealants that are easily opened and reclosed when wearing surgical gloves.” Taylor projects the U.S. sterile packaging market will grow at a compounded annual rate of 7.2 percent from 2014 to 2019.
- Economical—strong, durable and tear resistant, plastic packaging saves energy, space and money. Plastic containers, which generally require less energy to manufacture than other packaging, also require less fuel to transport than other packaging materials that are invariably heavier and more bulky. Additional savings come from reductions in shipping damage and elimination of the need for additional packing materials, such as partitions between individual products. Strong enough for stacking and moldable into space-saving shapes, plastic containers can maximize warehousing room and lower storage costs.



Among the key qualities  
that distinguish  
plastic packaging:

- Durable
- Improve food preservation
- Safe
- Light weight
- Design freedom
- Adaptable
- Enhance medical safety and effectiveness
- Economical

## Conclusion

Plastic packaging has become ubiquitous across the globe because of the virtually endless advantages it offers over other forms of packaging. The ability to meet unique packaging needs—from anti-static protective packaging for electronic components to shelf-stable containers for food products that once required costly cold storage—make plastics the hands-down preference for just about every form of packaging. Because they can be molded to fit contours, plastics provide the ultimate protection in packaging office machines, entertainment units, computer components and other delicate products. The unique properties of plastics make it particularly suitable for a variety of medical needs in hospitals, doctors' offices and drug stores. Plastics are tough enough to withstand the stresses of transportation, yet capable of screening out even the smallest particle of dust. Plastic packaging delivers infinite benefits.

Every day, new uses for plastic packaging are discovered and new varieties of plastics are developed to accommodate them. In addition to the unique advantages plastics provide to packaging applications, it also provides these advantages as an environmentally sensible material of choice, helping companies reduce their carbon footprint. For example, plastic packaging takes less energy to create relative to comparable packaging made of other materials, and reduces the weight of truck payloads allowing companies to ship more product in fewer trucks. These issues, along with the increasing number of options for recovering and recycling this valuable material, are addressed in detail in this report's section on Environmental Concerns.

## A QUICK HISTORY OF FOOD PACKAGING!

**1954** Robert W. Vergobbi patented zipper storage bags. Minigrip licensed them, intending to use them as pencil bags. But it soon became apparent the bags had greater utility than that. Ziploc® bags were introduced in 1968 as food storage bags. The first baggies and sandwich bags on a roll were introduced.

**1959** Wisconsin manufacturer Geuder, Paeschke and Frey produced the first licensed character lunch box—a lithographed Mickey Mouse on an oval tin with a pull-out tray inside. Plastic was used for the handle and then for the entire box beginning in the 1960s.

**Mid-50s** Swanson® TV Dinners capitalized on two post-war trends, the popularity of time-saving devices and fascination with television. More than 10 million TV dinners were sold during the first year of national distribution. The aluminum trays were replaced with plastic, microwavable trays in 1986.

**1970s** two-liter plastic beverage bottles and the one gallon plastic milk jug appeared on the market. By 2007, thanks to lightweighting, they had shed a third of their weight.

**1988** the Society of the Plastics Industry introduced a voluntary resin identification coding system, providing a consistent system for identifying plastics resins used in packaging containers.

**1996** salad-in-a-bag packaging (metallocene-catalyzed polyolefins) was introduced, helping to reduce food waste and making it easier to purchase fresh produce.

**2000** flexible plastic tubes for yogurt became available making it possible to enjoy a tasty Calcium-rich snack on the go.

**2010** Metallyte™ films were introduced to help keep sharp contents (coffee beans, grains, noodles and croutons) fresher by reducing packaging tears. The new films are also lighter than foil-based designs.

That same year, Heinz® Dip & Squeeze, the first new ketchup packaging in 42 years, offered two ways to get at the ketchup—peel back the lid for easy dipping or tear off the tip to squeeze the ketchup onto your food. Another great innovation in fast food!

Source: *Plastics Packaging History: Innovations Through the Decades*, American Chemistry Council's [www.PlasticsMakItPossible.com](http://www.PlasticsMakItPossible.com).



# Plastics Packaging Wraps it Up





[Plastics] are lightweight compared to metals, ceramics, and glass and have an excellent balance of strength, stiffness, toughness, ductility and impact resistance. Many applications are using plastics to replace either metal or glass to reduce costs, leverage design flexibility and still maintain performance.

# Future Trends—Demographics



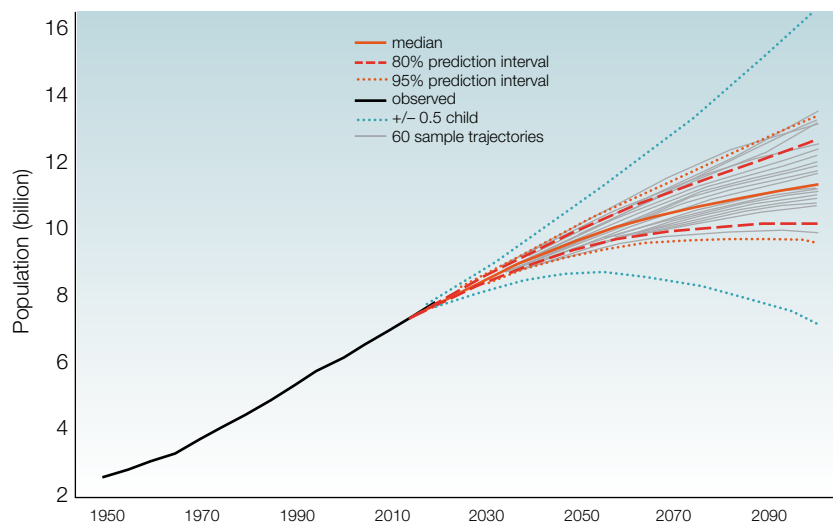
The growing middle class in developing countries, changing birthrates and life expectancies, shifting cultural norms and values all change global consumption patterns that affect industry, including the plastics packaging industry.

According to Ken Gronbach, multi-generational marketing expert and author of *The Age Curve: How to Profit from the Coming Demographic Storm*, demographics always implicitly mean that “changes are afoot,” and thus when demographic trends shift there is no need to conclude that the proverbial sky is falling. Smart industries and companies pay attention to demographics in order to anticipate market demand and adapt their business strategies, manufacturing processes and consumer products in order to meet the needs of shifting populations.

For the past 70 years, American industry has benefited from a population boom, both within the U.S. and globally. The trending worldwide decline in birth rates does not mean that population growth is grinding to a halt, it just means that the rate of growth is slowing, a trend that is expected to continue until at least mid-century.

In fact, most projections estimate that the world population will reach at least nine billion people by 2050, a two billion person increase over the estimated seven billion population figure that was believed to have been reached in October 2011. While most of the world’s population growth over this time will occur in India, Pakistan, Bangladesh, Ethiopia, Republic of Congo and other African countries, the U.S. is also expected to add more than 100 million people by 2050. And while many European countries are experiencing below-replacement birth rates, some of these countries are still projected

World Total Population



Source: United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Prospects: The 2015 Revision*. <http://esa.un.org/undp/wpp/>

to experience modest population increases going into 2050. However, Russia and the Ukraine are certainly the exception, as their respective populations are projected by some to experience declines of up to 25 percent by 2050.

All this to say that the size of the plastics packaging industry’s potential customer base is not about to shrink or collapse, it will continue to experience growth at least until 2050, and probably longer. Albeit, the rate of this potential customer population growth has been in decline, with an average global population growth rate pegged at just over two percent in the late 1960s expected to decelerate down to below one percent by the early 2020s. Nevertheless, one percent still represents growth.

And this continued growth is likely responsible for some of the healthy historic growth and future projections being parlayed about the packaging industry, of which plastics remains a primary and expanding component:

- The global plastic packaging industry experienced roughly 7.2 percent compound annual growth between 2001 and 2010, making it the fastest growing segment of the overall packaging industry, according to *Research and Markets*.
- “The flexible food packaging market in North America will grow at a compound annual growth rate of 5.72 percent during 2014–2019, says a new report—*Flexible Food Packaging Market in North America 2015–2019*—from *Research and Markets*.
- The above report also claims “there has been an increased demand for flexible plastic products and solutions with plastic packaging replacing metal and glass packaging, especially for food products.”
- Pira International forecasts that rigid plastics and flexible plastics will experience the highest growth—at around four percent—of all packaging materials from 2011 to 2016.

Along with the projected numerical change in world population going forward to 2050, demographics means the composition of the population is changing, as some countries will grow “old,” and others will grow “young.” Gronbach observes that the populations of Europe, North America, Japan, South Korea, and China, will be dominated by those over 30, while other parts of the world—especially in Africa—will have populations dominated by those under 30.

Additionally, declining birth rates, increased life expectancy and a shift in household demographics are all contributing to changes in consumption. Particularly in North America and Europe, family structures are changing. Many in Generation X and the Millennials are delaying marriage and starting families. And when they do shift their focus from career to starting a family, those family structures are varied as much as their purchasing power.

So, what does all this mean for the plastics packaging industry? On the macro-economic level the potential customer base remains healthy, with an expected continued expansion of this potential base in the Americas, Asia and Africa, though not so certain in Russia, the Ukraine, and Europe, where the current influx of migrants could significantly change the populations of EU member countries. While population age compositions and dynamics of household structure will undoubtedly impact consumer choices and patterns, there is no reason that either should have a negative impact on the plastics packaging industry. Plastic packaging is used for a variety of goods, products and food purchased by all age groups, and the changing dynamics of households may result in an increase in overall household purchases rather than a decrease (more on this below).

## Baby Boomers

In the U.S. the two largest consumer groups that should be of most interest to the plastics packaging industry are the Baby Boomers and Generation Y (aka, “millennials”). The estimated 79 million Baby Boomers (ages 51 to 70) as of 2015 grew up with plastics. And while their power as consumers is on the wane, Boomers remain significant consumers of food and healthcare products, both of which serve among the biggest end uses for plastic packaging.

“Boomers are redefining what it means to be old,” writes Deborah Weinswig, executive director of global retail and research for Fung Business Intelligence Centre of New York. “They are healthier, richer and more active than previous generations of older Amer-

icans...and will remain healthy spenders as they age. Given its sheer size and economic clout, the 50-and-older demographic will remain the dominant and most influential consumer group for years to come. Forward-minded companies are rethinking their tired presumptions about older customers and finding new and lucrative ways to reach them.”

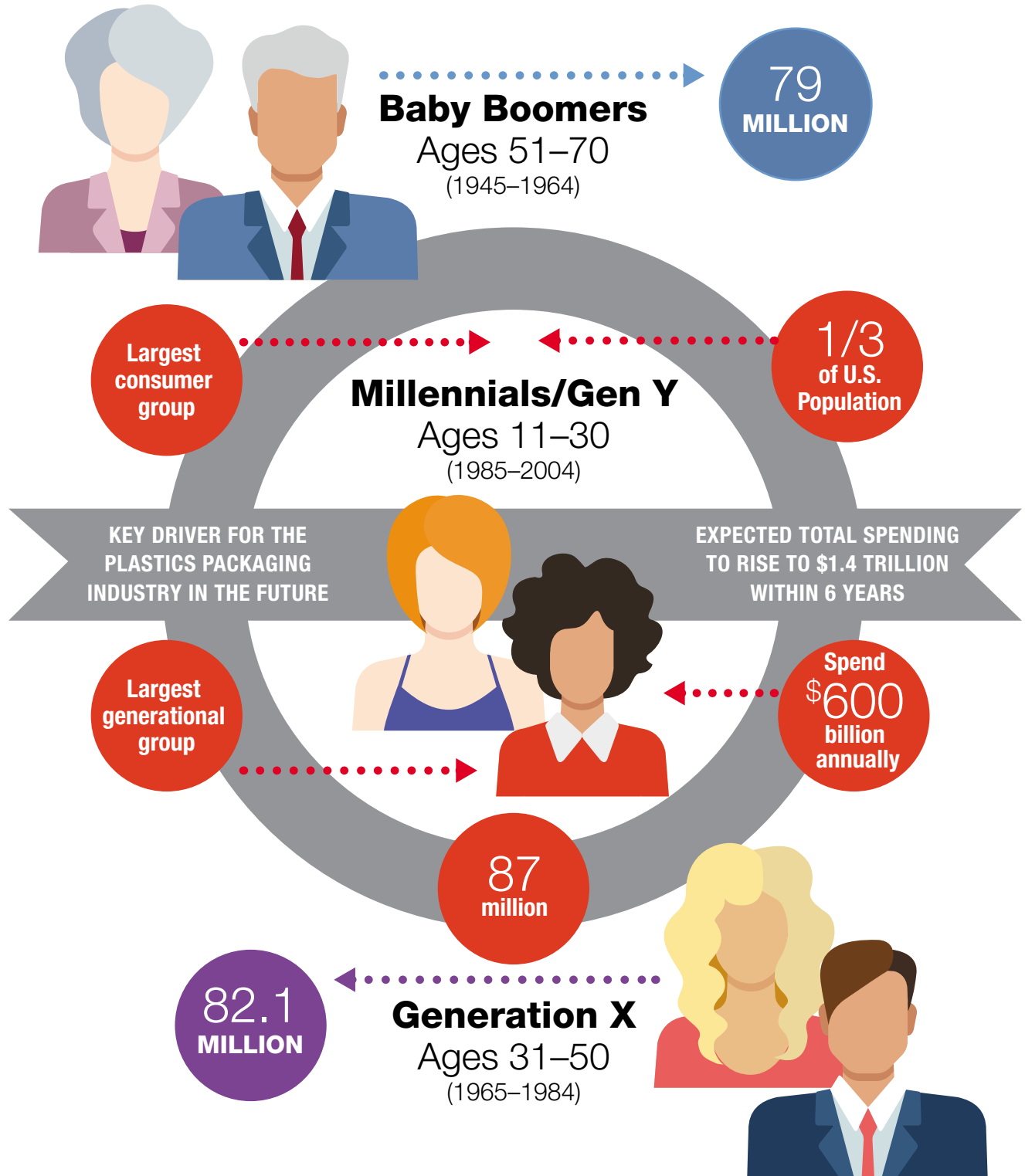
“We see an unprecedented competitive and profit-growth opportunity for companies that can provide the products, services and shopping experiences that meet this cohort’s changing life-stage needs,” Weinswig said. In terms of grocery spending, she cited research

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that indicates boomers will control more than half the dollars spent on food in the U.S. this year. “Given their preoccupation with health and wellness, older Americans are particularly responsive to food and beverage products that pack a nutritious punch. They also tend to gravitate to brands and organizations that offer medical and wellness mentorship and guidance.”



# Three Generations



Weinswig said boomers dominate 1,232 CPG categories and account for close to half of CPG spending, yet “older Americans feel invisible to most marketers.” She said people 55 and older control more than 75 percent of the nation’s household net worth of \$81.5 trillion and outspend millennials by nearly \$8,000 on average. “Yet consumer-centric companies have been slow to respond to the demands of this powerful new consumer force,” she said, adding that aging boomers “don’t want to be approached in ways that remind them of their age. Products that are overtly marketed to older boomers risk alienating younger ones.” Weinswig noted that boomers differ in many ways and “a one-size-fits-all approach won’t work.”

## Generation X

Generation X is the generation born after the Baby Boom. Harvard University uses those born 1965–1984 to define the group. In a 2012, article for the Joint Center for Housing Studies of Harvard University, George Masnick wrote that the “Census counted 82.1 million” Gen Xers in the U.S. Jon Miller at the Longitudinal Study of American Youth at the University of Michigan wrote that Generation X refers to adults born between 1961 and 1981, an earlier set than that set by Masnick. And the Population Reference Bureau cited Gen X falling between 1965 and 1982.

In sum, the parameters of Generation X are up for grabs. Even so, analysts feel obliged to define it. Compared with previous generations, Gen X represents a more heterogeneous generation embracing social diversity in terms of such characteristics as race, class, religion, ethnicity, culture, language, gender identity and sexual orientation. Sometimes called the MTV generation, they are into music videos, new wave music, heavy metal and hip hop. Now entering middle age, Gen Xers represent a major segment of the consumer market. The U.S. Census Bureau reports that Gen X holds the highest education levels among various age groups.

According to authors Michael Hais and Morley Winograd, “small businesses and the entrepreneurial spirit that Gen Xers embody have become one of the most popular institu-

tions in America.” They tend to encourage individuality and risk taking.

## Millennials

The estimated 87 million Millennials or members of Generation Y (ages 11 to 30) as of 2015 are now the largest consumer generation in U.S. history, and will be a key driver for the plastics packaging industry going forward. This generation makes up about a third of the U.S. population and is significantly influencing market trends. They are the largest generational group in history and on average spend about \$600 billion annually, a total expected to rise to \$1.4 trillion within the next six years.

Both boomers and millennials profess great concern about the environment, but in-depth surveys suggest the millennials are more serious about it. Research conducted by brand marketing firm Oliver Russell (<http://www.oliverrussell.com/millennials-and-social-responsibility-marketing>) indicates their purchasing choices are influenced by companies that exercise positive social and environmental best practices across the entire supply chain.

Millennials are looking for healthy and convenient food and beverages that come in packages that are easily opened and resealed for later use, and that feature recyclability and other green qualities.



“Millennials view taking care of themselves and the environment as one and the same,” wrote the authors of the Oliver Russell study.

Millennials are looking for healthy and convenient food and beverages that come in packages that are easily opened and resealed for later use, and that feature recyclability and other green qualities. Three out of four millennials would choose soup from a carton instead of a can. Healthy and eco-friendly products are dominating purchases in this market, but millennials also look for transparent information about a product’s sustainability credentials, with claims supported by third parties.

One example of a large brand owner looking to appeal to “Millennials”, Pepsi in 2011 came out with a new plastic bottle sourced from 100 percent plant-based materials, and other food and beverage makers followed suit with their own use of plant-based and recycled packaging.

Plastics packaging should continue to prove especially utile for food packaging. In addition to consumer appeal, packaging has a job to do. Over the decades, our food systems have become increasingly industrialized, where food is produced on a mass scale and shipped for thousands of miles, often across international borders. Food safety and freshness are considered crucially important for all of the U.S. generations, and plastic packaging has proven to be the best material for moving food from farm or factory to the consumer.

### **Global Family Change**

With regard to the changing family/household dynamics, the trend of delaying marriage and parenthood (and living with parents into one’s late thirties) will likely be a boon to the plastics packaging industry. A simple way to look at is to consider that while a traditional two-parent with one

to three children household will perhaps need to purchase one roll of Saran Wrap per quarter, multiple adults living in separate housing units might need to purchase two rolls of the same product per quarter.

This is a global phenomenon not confined to the U.S. According to Nicholas Eberstadt of the American Enterprise Institute, who published his findings in a *Wall Street Journal* op-ed in February 2015, this trend transcends geography, stage of economic development and even culture. He noted that high levels of income and educational attainment are “not pre-conditions for the new family revolution in those spots on the globe it hasn’t reached.” A peek inside homes around the world, he said, is likely to reveal single occupants, single parents and unmarried couples. In this new evolving model of human existence, there are fewer larger homes with people assigned to preparing meals for the group. This trend encourages reliance on small, packaged foods easy and quick to prepare. This suggests a strong growth market for food packaging in the years ahead.

Economists Betsey Stevenson and Justin Wolfers, economists at the University of Michigan, assert that the role of households is changing as the modern corporation has come to supplant the family in many economic functions.

Another factor in the shifting role of the family is longevity as rising life expectancy diminishes the centrality of children to married life. Couples today expect to live together (or separately) many decades after their chicks have flown the coop. Only 41 percent of married couples currently have their own children present in the household, down from 75 percent in 1980. All of this changes the

way people approach their lives and perceive their roles in society. Eberstadt refers to the “seemingly unstoppable quest for convenience by adults demanding ever greater autonomy” and notes that “rational choice” and “elective affinities” are playing roles in household formation.

Predictably, smaller households are having a dramatic impact on consumption patterns, particularly with consumption of packaged foods. It is an established fact that Americans waste about half the food they purchase, usually in the home. A study by the U.S. Department of Agriculture concluded that in the U.S. some 31 percent—or 133 billion pounds—of the available food supply at the retail and consumer levels in 2010 went uneaten. The estimated value of the food loss was \$161.6 billion.

According to the U.S. Environmental Protection Agency (EPA), the U.S. spends about \$1 billion a year just to dispose of food waste. Food leftovers are the single largest component of the waste scraps from residences, commercial establishments such as restaurants, institutional sources such as school cafeterias, and industrial sources such as factory lunchrooms. Over 12 percent of the Municipal Solid Waste (MSW) generated in

**Only 41 percent of married couples currently have their own children present in the household, down from 75 percent in 1980. All of this changes the way people approach their lives and perceive their roles in society.**

American households was food scraps and less than three percent was recovered. The remainder was thrown away and disposed of in landfills or combusted in generators. The decomposition of food and other organic waste in landfills produces methane, a greenhouse gas 21 times more damaging to the environment than carbon dioxide. Landfills are the largest human-related source of methane in the U.S. accounting for 34 percent of methane emissions.

“One would think that less developed countries would be less wasteful of food but in many developing countries, post-harvest losses of food grains can reach as high as 50 percent,” said Patty Long, SPI Senior Vice President for Industry Affairs. “Without proper storage, transportation and packaging, perishable food items are particularly vulnerable to spoilage and loss. Our food waste problem would be much more severe without plastics packaging.”

Rising awareness of the waste and its attendant costs is increasing demand for packaged foods that can be purchased in small amounts in sealed containers, and the excess then resealed for later use. Likewise, smaller households increase the demand for closer regulation of food purchases and consumption.

While household populations are growing smaller, the number of overall households will continue to increase, and this should drive up the total volume of packaging, increase the number of store visits, and necessitate growth of in-store merchandise and shelf-ready packaging. This should prove true in America, and also in Europe, which is currently experiencing a similar demographic shift in household/family structure. Other countries are expected to follow a similar pattern as

their economic development spurs lower birth rates.

As for the rest of the world, growth of the plastics packaging industry has largely followed in step with economic growth, with the fast growing economies of the “BRIC” (Brazil, Russia, India and China) countries experiencing the largest growth in the plastics packaging market.

China currently represents the second-largest packaging market in the world, and is expected by most analysts to surpass the U.S. as the largest packaging market by 2020. As with the U.S., the key end-user markets in China for plastics packaging is food and beverage products, and analysts believe

that plastics packaging for pharmaceuticals and health care is poised for rapid growth.



India is at once a swiftly growing market for plastic packaging and a place where plastic packaging is under fierce attack by environmental and consumer advocates. Over the last three years, proposals have been repeatedly brought forward by governmental and non-governmental entities at national, state and local levels to ban plastic food and drug packaging in India. The primary target for bans is PET packaging based on data that has been discredited by a large group of scientists and that show migration of heavy metals and endocrine disrupting substances from PET packaging to its contents. Multilayer and multi-material packages have become increasingly more prominent in the debate as well, driven by concern about the present lack of infrastructure and technology to recycle these materials.

The Indian food, drug and plastics industries have done yeoman's work, with help from international industry partners, to educate Indian consumers and government officials about the demonstrated safety and utility of PET in these packaging applications. SPI sent a letter to India's Ministry of Health and Family Welfare on behalf of the North American Plastics Industry, with the American Chemistry Council and Canadian

Plastics Industry Association as signatories, which carefully explained the scientific and regulatory basis for the safe use of PET in food and drug packaging worldwide. Shortly after receipt of this and letters from other local and international industry groups, the Ministry halted movement on a proposal to ban PET use in primary packaging of liquid oral drug formulations for pediatrics, geriatrics, pregnant women and women of childbearing age. Indian industry has also worked with international partners including SPI to explain the life cycle advantages of using multilayer and multi-material packaging in many cases in spite of the fact that recycling is not presently an option for end of life.

The battle is still far from over, and the real tragedy would be for India's vast population to lose access to safe, affordable food and drugs packaged in plastic. Government officials are increasingly recognizing this and discovering that data cited as justification for bans has been dismissed as unreliable by much of the scientific community. As in other places, industry is in a protracted conflict in India, but progress on the issue is slowly being made.

India's packaging market considered to be the world's sixth largest in 2011, and along with its fast growing population expected to be the fourth largest by 2016. Food and beverage and pharmaceutical end-use plastic packaging has been experiencing especially robust growth, which will likely accelerate with strong population growth and the development of emerging food safety laws.

Overall, Asia's plastics packaging market was projected by Pira International to experience about six percent compound annual growth from 2011 to 2016.

Brazil's packaging industry is considered to be the seventh largest in the world, with its growth largely driven by a healthy population and rising per capita disposable income. Pira International forecasted that South America as a whole would experience almost five percent compound annual growth in its plastics packaging industry between 2011 to 2016, a significant increase over the less than one percent rate of global growth from 2003 to 2011. Recent trends in Brazil, however, suggest this projection is on the high side.

Russia's packaging industry has grown in step with its economy, allowing it to become the 10th largest packaging market in the world. And while favorable taxation, limited packaging waste laws and expected high investment returns may make Russia look attractive to international packaging manufacturers, there is some concern about the country's projected population decline.

On a relative scale, Africa's plastics packaging market is quite small compared to those of the U.S., Europe and the BRIC countries, however, according to *africa.com*, the continent has become a "key player" in the international plastics and

packaging industry, and is now "one of the fastest growing markets for plastic goods and machinery in the world." Among key countries cited in the report as high plastics growth areas are Kenya, Uganda, Mozambique, Tanzania, Ethiopia and South Africa, with the last considered the biggest player in the continent with regard to the plastics and packaging sector.

On a population basis, the African continent currently has a population of just over one billion people, which is projected to more than triple to three to four billion by 2050. Some African countries have stable governments and strong economies, while others do not. However, the report notes that Africa remains a difficult continent in which to conduct business. Most African countries ranked quite low on the World Bank's "Ease of Doing Business" survey.

## Conclusion

The overall demographic picture makes a compelling case for continued strong growth of plastics in packaging into the foreseeable future despite the trend to smaller households. This applies across the board to all products sold in plastic, but especially in food. Where people are pressed for time, which is pretty much everywhere, there will be demand for products that are packaged in a single-serving, can be quickly prepared and prevent spoilage.

This packaging transformation is being driven by convenience and quality demands, setting new consumer priorities and driving their decision-making. For example, flexible pouches are now a staple in the baby food aisle, providing safe, non-breakable, resealable, convenient on-the-go packaging. These pouches are also aimed at the snack food aisle for school-age children.

Similar changes are going on in the coffee aisle, where the traditional tin can is no longer a staple, but rather a variety of flexible and rigid plastic containers—for everything from ground coffee and single-serve coffee pods to concentrated liquid coffee drops. Overall packaging trends are seeing more designs compatible for "on the go" and single use, addressing consumer's strong desire for convenience in the grocery aisle.

On the flip side, the Farm-to-Table movement, which is concerned with producing food locally and delivering that food to local consumers, decreases the demand for packaging in this realm. This trend towards organic farming initiatives, sustainable agriculture, and community-supported agriculture may have a limited but diminishing impact on packaging needs over time.

Plastics perhaps do the job of packaging better and more efficiently than alternative materials such as metal, glass and paper, and are equally, if not more, sustainable. Concerns about the environmental impact of plastics linger in the background, which underscores the importance for industry to focus on increasing recovery opportunities so plastic packaging also wins in the end-of-life category when stacked up against alternative materials.

### THE FASTEST GROWING WORLD ECONOMIES

# BRIC

Brazil  
Russia  
India  
China

The overall demographic picture makes a compelling case for continued strong growth of plastics in packaging into the foreseeable future despite the trend to smaller households.

# Future Trends—Technology

The plastic packaging industry continues to grow and plays an important role in many fields such as engineering, transportation, medical and agriculture—and especially in packaging. It is in fact difficult to find the point at which plastic cannot be considered an essential component of many items.

Polymers, the essential ingredient of plastics, are materials with a seemingly endless range of possible characteristics and colors. “In our color library, we have more than 20,000 colors,” said Wylie Royce of Royce Colors. “We add 25 to 30 new colors every week.”

Polymers have many inherent properties that can be enhanced by a wide range of additives to broaden their use and application. The ability to design or engineer a

polymer for specific applications makes plastics unique among basic materials.

The most common plastic in use today in packaging is polyethylene (PE), with an annual global production of some 80 million tons. Its primary purpose is in packaging—everything from plastic bags, plastic bottles, plastic films, etc.

Polyethylene terephthalate (PET or PETE) is clear and tough and has good gas moisture barrier properties. The vast majority of this plastic ends up in soft drink bottles and blow-

molded containers, although usage as sheet applications are increasing.

The second most important plastic in packaging in the U.S. is polypropylene (PP), a thermoplastic polymer used in such diverse areas as labelling and packaging, plastic parts and reusable containers, laboratory equipment, textiles, and automotive components. In 2013, the global market for polypropylene was about 55 million metric tons.

## Plastic Packaging Products

The number and variety of plastics being used in packaging is voluminous and bewildering reflecting the utility of plastics and the creativity of researchers who are constantly coming up with new products. However, a few of the basics demand recognition:

**Plastic wrap** is a thin plastic film typically used for sealing food items in containers to keep them fresh. Plastic wrap, typically sold on rolls in boxes with a cutting edge, clings to many smooth surfaces and can thus remain tight over the opening of a container without adhesive or other devices. Once commonly made of polyvinyl chloride (PVC), low-density polyethylene (LDPE) is gaining market share in this segment.

**Shrink wrap**, made up of polymer plastic film, it shrinks tightly over whatever it is covering when heated. Heat can be applied by passing the product and film through a heat tunnel on a conveyor, or manually with a heat gun.



The number and variety of plastics being used in packaging is voluminous and bewildering reflecting the utility of plastics and the creativity of researchers who are constantly coming up with new products.

There are many uses of shrink wrap, from small products such as beverage cans or CDs and DVDs, all the way to heavier forms of shrink wrap used for containment of large plant equipment and components; for boats and other vehicles; for palletized freight; and for disaster contingency and relief projects such as damaged buildings and roofs.

**Bubble Wrap** first came into the market in 1960 and quickly became very popular because of the protective properties it offers. The maker of Bubble Wrap, Sealed Air Corporation, is coming out with a new version of its signature product. The new packaging, called iBubble Wrap, will be sold in flat plastic sheets that the shipper will fill with air using a custom made pump. The inflated bubbles look like the traditional kinds with one unfortunate difference: they do not burst when pressure is applied. The air simply moves into adjacent pockets.

The new product may not produce the same old fashioned fun of popping bubbles, but it has the same utility and convenience with a much smaller environmental footprint. The old Bubble Wrap was shipped in giant pre-inflated rolls that took up precious room in trucks and warehouses. One roll of the new iBubble Wrap will use up one fiftieth of the space required by the older kind.

Bubble Wrap is just one of many products competing for the protective packaging business which hit \$20 billion in 2013, according to Fredonia Group, a research firm. Retailers like Amazon and Target use alternative inflated film products, such as air pillows. Sealed Air says its most popular protective packaging is liquid foam.

### Expanded Polystyrene (EPS)

Styrofoam™, has become a popularized name for EPS, but it is a trademarked brand of closed-cell extruded



polystyrene foam owned and manufactured by The Dow Chemical Company. EPS is widely used in applications due to the insulating properties, impact resistance. Those applications include disposable coffee cups and other food service items, coolers or cushioning materials used in packaging, which is typically white and is made of expanded polystyrene beads.

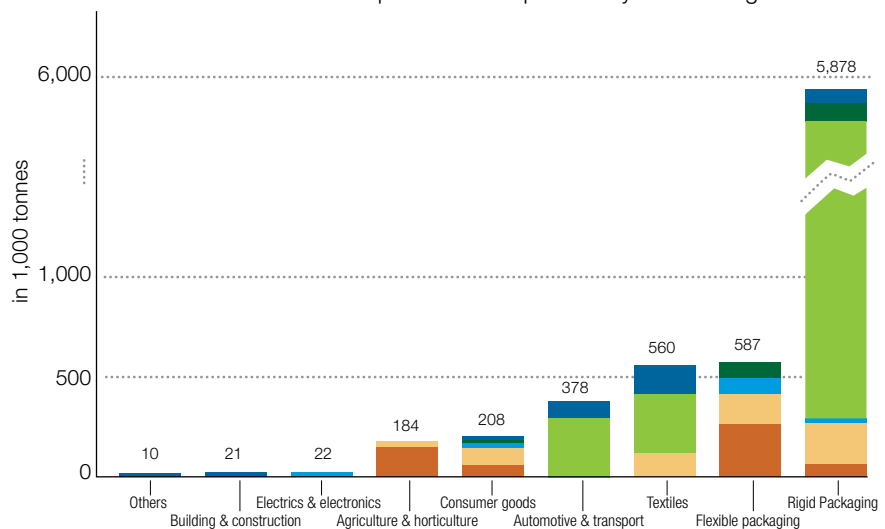
EPS is composed of 98 percent air, making it lightweight and buoyant, though it occupies a lot of space and for that reason has limited use in packaging. “Styrofoam is our only polystyrene product,” said Jeff Wooster, Global Sustainability Director, Packaging and Specialty Plastics, for The Dow Chemical Company. “It is used for insulation and for shipping valuable items such as televisions. It is cheap to make, lightweight and does not use much material. Coffee cups are not made of Styrofoam; they are made from expanded polystyrene foam.”

### Barrier Films

Multi-layered films are perhaps on the cutting edge of plastics packaging technology, with five layers becoming an accepted standard—although some firms are experimenting with up to nine layers. Multi-layered film allows you to achieve, because of the advantages of an unusual combination of properties, the following:

- Superior gas and moisture barrier properties.
- Barrier to flavor permeation.
- Barrier to aroma permeation.
- Resistance to solvents.
- Ultraviolet resistance.
- Excellent flex-crack resistance.
- Good printability.

2019 Global Production Capacities of Bioplastics by Market Segment



Biodegradable: PLA & PLA-blends, Starch blends, Other<sup>1</sup> (biodegradable)  
 Biobased/non-biodegradable: Bio-PET30<sup>2</sup>, Bio-PE, Other<sup>3</sup> (biobased/non-biodegradable)

<sup>1</sup> Contains regenerated cellulose and biodegradable cellulose ester; <sup>2</sup> Biobased content amounts to 30%;  
<sup>3</sup> Contains durable starch blends, Bio-PC, Bio-TPE, BIO-PUR (except thermosets), Bio-PA, PTT

Source: European Bioplastics, Institute for Bioplastics and Biocomposites, nova-Institute (2015).  
 More information: [www.bio-based.eu/markets](http://www.bio-based.eu/markets) and [www.downloads.ifbb-hannover.de](http://www.downloads.ifbb-hannover.de)

## Bioplastics

Bioplastics are a relative newcomer to the plastics packaging scene. As consumers express increased interest in “green” products, healthier lifestyles and protecting the environment, there is an increased emphasis in reducing the consumption of fossil fuels which are the basic component of most standard plastics materials. Bioplastics provides at least a partial answer to this challenge.

Bioplastics are plastics that are either: a) biobased, b) biodegradable; or c) both biobased and biodegradable. Biobased bioplastics are plastics derived from renewable biomass and can be composed of starches, cellulose, biopolymers and a variety of other materials. Some, but not all, bioplastics are designed to biodegrade. Biodegradable plastics can break down in either anaerobic or aerobic environments, depending on how they are manufactured. They have a variety of uses, including packaging. They are used for bags, trays, meat packaging, vegetables and bottling for soft drinks and dairy products.

The terminology used in bioplastics can be confusing. Some use the term to describe a plastic produced from a biological source. But all plastics, bio and petroleum based, are technically biodegradable meaning they can be degraded by microbes under certain conditions. However, some degrade so slowly they are considered non-biodegradable. Simply referring to a product or material as biodegradable is not sufficient claim because the disposal location will dictate the time for complete biodegradation and assimilation by microbes.

But biodegradability in and of itself does not define the market for bioplastics. “Some of our customers care about bio-based content and some do not,” said Steve Davies, Director of Marketing and Public Affairs for NatureWorks, a bioplastics company based in Minnesota. “Our customers are mainly interested in the functionality of the product. They prefer it to be green, but mainly they want to know if it works.” NatureWorks is

planning to use non-food alternative feedstock from biomass in its new plant to be located in Thailand.

Metabolix, a company based in Cambridge, MA, specializes in a bioplastic that is fully degradable. The substance used is Polyhydroxyalkanoates (PHAs) which are linear polyesters produced in nature by bacterial fermentation of sugar or lipids. “Right now we use a variety of feedstocks which will naturally biodegrade in soil and water, and will naturally compost in a variety of schemes,” said Max Senechal, Metabolix Vice President of Strategy and Commercial Development. “This is the core of our technology—engineering microbes.”

Metabolix is now focusing on use of corn starch or sugar because of its availability and price. “But we can use a broader range of feedstocks,” Senechal said. Metabolix does not use recycled plastic and its primary focus is on serving the demand for environmentally friendly product. “Most of our customers are looking to increase their bio content,” he said. “People can use our materials for end of life management. Inherent biodegradation is important to them.

Another venture in PHAs is MHG in Bainbridge, Georgia, offers PHA from canola seed. The company crushes it into oil which it converts into a completely

Bioplastics,  
 whether biobased  
 or biodegradable,  
 offer consumers  
 additional options for a  
 “greener” lifestyle.



**BIOPLASTICS ARE  
PLASTICS THAT:**



originate from a  
renewable resource



are biodegradable



are renewable and  
biodegradable

customizable bio-plastic. MHG claims it challenges petroleum-based plastic in price and performance. “MHG’s commitment is to the environmental, social and economic well-being worldwide through the application of renewable and sustainable products,” said Paul Pereira, executive chairman and CEO. “The applications are endless.”

While Sealed Air has come up with a new method for producing Bubble Wrap—that saves space but does not permit users to “pop” the individual air sacs—it has also developed an innovative packaging product that uses mushrooms instead of plastic. Restore® packaging uses mycelium, the root-like structure of mushrooms, to bind agricultural waste

together in a mold custom-designed by Sealed Air to provide a protective cushion for the new generation of light-emitting diode (LED) bulbs being marketed today as a longer-lasting, more electrically efficient alternative to incandescent and fluorescent lamps. The new packaging, unlike plastic, is biodegradable.

Late last year, Tetra Pak, a multinational food processing and packaging company based in Sweden, launched the industry’s first carton made entirely from plant-based, renewable packaging materials. The Tetra Rex® carton is the first in the market to have bio-based low-density polyethylene (LDPE) films and bio-based high-density polyethylene (HDPE) caps, both derived from sugar cane. In 2013, Tetra Pak delivered 1.1 billion packages to customers worldwide featuring bio-based caps (made from plastic derived from sugar cane), nearly doubling the number sold the year before.

Cereplast is working to develop bioplastics that are based on algae. BASF is looking into replacing one of the key raw materials it uses in production of its biodegradable polyester polymer with a bio-based material. Startup company Micromidas plans to produce PHA using carbon in sewage sludge as feedstock to make the plastic. And the U.S. Department of Agriculture is investigating opportunities to use the keratin from poultry feathers for making bioplastics. The possibilities are seemingly endless.

For now, bioplastics is just a blip on the screen, accounting for less than one percent of the total global plastics usage. But European Bioplastics estimates the annual global production of bioplastics will increase from 1.7 million tons in 2015 to 7.8 million tons by 2019.

### Conclusion

Plastics packaging technology is clearly a mature industry in terms of its dominance of many phases of packaging that require special treatment, whether it be preserving and protecting food and medicine or assuring the integrity of advanced technology products such as cell phones and computers. Yet like any other industry, the enterprises in plastics packaging are constantly challenged to come up with creative new ways to do their job better for less cost providing greater and greater functionality for the consumer—functionality that helps solve problems for the seller as well as the consumer. Packages that are easier to stack, that can be interlocked, or that provide greater storage capacity are likely to increase in popularity. And the latest trend is the “selfie” movement can be found in innovative packaging—self-opening, self-closing, self-sealing, self-cleaning, self-dosing, self-regulating, self-heating, etc.

Technological advances will allow packaging to continue to adapt to assure our solutions protect, preserve, and transport as well as inspire, instruct and educate. The introduction of a new generation of Bubble Wrap is a case in point; perhaps the most advanced new development is the multi-layer plastic wrapping that serves several different purposes simultaneously. The most sweeping one would be the emerging field of bioplastics.



**European Bioplastics estimates the annual global production of bioplastics will increase from 1.7 million tons in 2015 to 7.8 million tons by 2019.**

# Future Trends—Economics

It is a challenge to come up with reliable data on the total impact of plastics in packaging on the United States economy, never mind the world, because of a lack of uniform reporting from nation to nation and from state to state. In some instances, companies are reluctant to report how much they spend on packaging because it is considered a trade secret. It represents a cost that might be useful to the competition.

Dow Chemical estimates that the global packaging industry is worth approximately \$700 billion, according to Dow's Jeff Wooster, of which about a third, perhaps \$250 billion, is plastics. "Some put that number higher," he said. "But it is easy to confuse the value of the plastic with the overall value of the product which in many cases is inseparable. Packaging typically represents about 10 percent of the value of the product, though that can vary considerably according to the product." Wooster said Dow's packaging and specialty packaging business represents about 35 percent of its overall business. "It is our largest market."

That ratio would appear to agree with data from the American Chemistry Council (ACC) which reported that in 2014, packaging accounted for 34 percent of the market for thermoplastic resins—a category that includes low-density polyethylene (LDPE), linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE), polypropylene (PP), polystyrene (PS), expandable polystyrene (EPS) and polyvinyl chloride (PVC).

However, ACC reports that another 19 percent of the total market for thermoplastic resins was exported, and it seems reasonable to assume that a major portion of that was destined for use in packaging, just as it is in the United States.

The SPI calculates that the U.S. plastics industry currently employs 940,000 people. If the 42 percent of plastics consigned to packaging is a guide, close to 400,000 Americans are employed, directly or indirectly, in producing plastics for packaging. And the market is growing. Between 2010 and 2020, ACC says the industry has announced or anticipates nearly \$47 billion in total new investments will come online. This includes \$25 billion in new capacity to produce plastic resins.

Capacity to produce polyethylene, the plastic resin most influenced by the abundance and low cost of shale gas, is expected to grow more than 50 percent by 2020. Polyvinyl chloride and polypropylene resins

also will benefit from abundant, affordable shale gas. More than 460 new plastics processing projects are underway or have been announced in more than 40 states, most of them in Indiana, Michigan, Ohio, Wisconsin, Texas and Illinois. All of this investment is expected to foster an increase of 20 percent in employment adding 128,000 direct jobs, 173,000 indirect jobs, and 161,000 payroll-induced jobs. In sum, total plastics industry jobs are expected to grow by 462,000 and payroll by \$27 billion, and about a third of that will be driven by demand for plastics in packaging.

## The Economic Environment

The prospects for plastics in packaging are directly related to the overall economy of the United States and the global marketplace. Beginning in 2014 and continuing into this year, world markets have been unsettled. China's vaunted economic machine is most likely growing less than the seven percent official rate, the European Union reports only modest growth, and Brazil is in recession. The United States and Canada are among the few bright spots on the global map. In both countries, GDP grew 2.4 percent in 2014, not great by historical standards but very positive compared to the world around us. The size of the United States economy and its relative vigor has made it an engine of growth for the world.

According to the ACC, packaging remains the largest market for plastic resins. Historically, packaging resin use has been correlated with "real" retail sales,



which are sales adjusted for inflation. Data from the Bureau of the Census and the Bureau of Labor Statistics indicate retail sales grew 2.1 percent in 2014, following a 2.8 percent gain in 2013. Consumer spending picked up in 2014 and this trend is expected to continue in light of the improving employment situation. Lower gasoline prices in 2015 are leaving consumers with more spending money. Meanwhile, Statistics Canada reports retail sales increased in that country, our biggest trading partner, by 4.6 percent in 2014 after rising 3.2 percent the year before. Thus, overall retail sales in North America grew 2.4 percent in 2014.

## Market Data for Major Resins

After five years of consecutive growth, North American polyethylene (PE) sales slipped in 2014. Total sales were 38.3 billion pounds, a 0.7 percent decrease from 2013. Export sales were a prime reason falling 13.2 percent from 2013 with sales of 6.8 billion pounds. Domestic sales of PE grew by 2.5 percent, ending the year at 31.5 billion pounds.

Low-density polyethylene (LDPE) sales rose to 7.0 billion pounds in 2014, up just 0.4 percent from 2013. Domestic sales of 5.4 billion pounds supported this growth, gaining 1.4 percent from 2013. Exports of LDPE fell 3.2 percent in 2014 to 1.5 billion pounds. LDPE production reached 7.1 billion pounds, up 2.8 percent from 2013.

Linear low-density polyethylene (LLDPE) sales slipped 0.7 percent from 2013 ending 2014 at 13.7 billion pounds. Domestic sales reached 10.9 billion pounds, an increase of 2.9 percent from 2013. Export sales dropped 12.6 percent in 2014 after a 7.4 percent increase in 2013. Domestic market segments for packaging film saw a sales increase of 2.9 percent in 2014. Production of LLDPE was 13.9 billion pounds in 2014, flat compared to the year before.

High-density polyethylene (HDPE) finished the year with total sales falling to 17.6 billion pounds, a decrease of 1.2 percent from 2013. Domestic sales grew 2.5 percent in 2014, reaching 15.1 billion pounds. Exports were down 19.1 percent, falling to 2.5 billion pounds in 2014. A few domestic HDPE market segments saw solid gains in 2014, including food packaging film which was up 20.7 percent. Production of HDPE was 17.5 billion pounds, down 2.2 percent from 2013.

Total polypropylene (PP) sales under the North American Free Trade Agreement (NAFTA) finished 2014 at 16.4 billion pounds, slipping 0.2 percent from 2013. The loss was driven by a dip in domestic sales which were down 0.4 percent to

15.8 billion pounds, which was countered by a gain in exports of 5.5 percent from 2013.

Polystyrene (PS) sales to the NAFTA region were 4.4 billion pounds, falling 3.2 percent from 2013. Sales were down in consumer and institutional markets, down 10 percent, but showed modest growth in the large market segment for food packaging and food service which was up 1.5 percent. PS production in the NAFTA region slipped to 4.45 billion pounds, falling 1.3 percent from the year before.

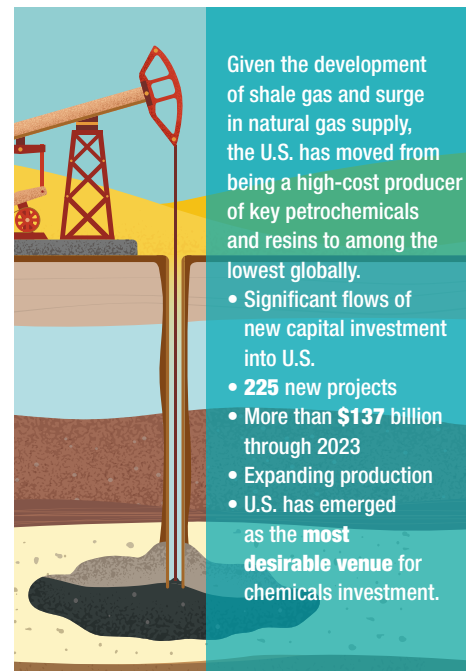
Shipments of expanded polystyrene (EPS) were up in 2014, with domestic sales gaining 5.1 percent over 2013 to reach 945 million pounds, and exports increasing by 4.9 percent. Production rose to 953 million pounds in 2014, an increase of 7.1 percent.

Polyvinyl chloride (PVC) production and sales volumes saw decreases in 2014. Domestic production at 15 billion pounds for the year was down 2.2 percent from 2013. Total sales and captive use was 15 billion pounds in 2014, a decline of 1.7 percent. Domestic PVC demand grew to 10.3 billion pounds, a 2.8 percent rise from the previous year. A drop in PVC export volumes countered domestic growth with exports losing 10.2 percent from 2013.

## Conclusion

The plastics packaging industry has done as well or better than could be expected in 2014 given the overall domestic and world economic situation. The outlook is more promising, though it may take a year or two for demand in foreign markets to reach prior levels. But demand from the domestic market should remain firm. The resins industry will continue to perform well. An enhanced competitive position for U.S. industry with regard to feedstock costs will support production and bolster growth.

Given the development of shale gas and surge in natural gas supply, the United States has moved from being a high-cost producer of key petrochemicals and resins to among the lowest globally. This shift in competitiveness is driving significant flows of new capital investment to this country. As of early 2015, some 225 new projects have been announced representing investments of more than \$137 billion through 2023. New capacity for petrochemicals and resins is significantly expanding production as these investments are coming online. The United States has emerged as the most desirable venue for chemicals investment.



# Future Trends— Environmental Concerns

The use of plastics in packaging is closely regulated by the U.S. Federal Government, primarily by the Environmental Agency (EPA) which is concerned about plastics in the environment and the Food and Drug Administration (FDA) which is concerned about the potential impact of plastics packaging on food and pharmaceuticals. The Consumer Product Safety Commission (CPSC) has jurisdiction over plastic packaging of toys for children and the Occupational Safety and Health Administration (OSHA) is responsible for the health of workers working with chemicals and other substances used in plastic packaging.

The Federal Trade Commission (FTC) is also engaged with plastics packaging related to marketing claims of products. The FTC offers “guidelines” related with terms such as recyclable, biodegradable, compostable, etc. “There are some exaggerated claims being made,” said Steve Davies of NatureWorks. “Some claims may be technically correct but irrelevant in practice. The FTC is really cracking down on misleading advertising campaigns.”

A variety of state and local agencies also exercise jurisdiction. All businesses engaged in plastics packaging must be fully engaged with the regulatory agencies—staying abreast of new regulatory developments and participating in the regulatory process to ensure decisions are based on sound science and not baseless concerns that are sometimes promoted by activist groups.

“There is a certain amount of what I call ‘chemophobia’ out there said Wylie Royce of Royce Color. “People should know that all of these substances have been thoroughly tested, and that new products brought on line must undergo a rigorous screening process to assure they are safe.”

“Food packaging is a major issue for obvious reasons of consumer safety,” said Kyra Mumbauer, SPI Director for Global Regulatory Affairs. “I can state that at least with regard to food packaging regulation, the industry has always been at the table working with the FDA and other interest groups to make certain regulations are based on sound science and with due recognition of their economic impact.” Mumbauer said the FDA has 35 full time toxicologists dedicated to reviewing and assuring the safety of substances used in food packaging.

The issue gets more complicated in the international arena, Mumbauer said. “One of our biggest issues is the lack of harmonization among various regulatory agencies around the world. A global company wishing to sell worldwide must comply with multiple regulatory environments. There may be only minor differences, but you still have to conduct multiple tests. Europe, South America and China have their own systems. When marketing globally, you have to know all of the rules and submit the same materials for testing everywhere.”

The challenge of meeting the requirements of multiple regulatory agencies in different countries is further complicated by the activity of a variety of non-governmental organizations (NGOs) that can and do wield considerable influence on both the regulatory process and public opinion. There exists a considerable array of such groups whose names are familiar—Greenpeace, The Sierra Club, The World

**All businesses engaged in plastics packaging must be fully engaged with the regulatory agencies—staying abreast of new regulatory developments and participating in the regulatory process to ensure decisions are based on sound science and not baseless concerns that are sometimes promoted by activist groups.**

Wildlife Federation, The Nature Conservancy, Friends of the Earth, the Natural Resources Defense Council, and many smaller groups that tend to spring up like flowers after a rain. To be sure, these organizations are generally concerned with issues beyond plastics packaging, but virtually all of them have strong opinions on plastics packaging, not always based on reality.

“The NGOs can complicate the process of trying to achieve sensible solutions,” said Mumbauer. “They often misrepresent the science of these issues to stir up alarm. The dangers they perceive are often vastly overblown, and they don’t consider the total impact. Without food packaging, you run the risk of spoilage, contamination, and salmonella. Plastic food packaging plays a key role in protecting consumers.”

When they perceive a threat to the environment or consumers, the NGOs can and do prod regulatory agencies into action. In some instances, they bypass Washington and wield their influence directly at the state or local level. But perhaps most importantly, they influence public opinion which in turn affects the policies of major brands that are sensitive to the concerns of consumers who care deeply about the environment and are concerned for their own safety and that of their children. Sometimes major brands and retail institutions effect dramatic change in products and production by the simple expedient of refusing to buy raw materials that do not meet their standards.

“This has become known as the Walmart effect,” said Kendra Martin, SPI Senior Director of Industry Affairs. “When Walmart responds to concerns expressed by NGOs by phasing out chemicals found in products and packaging sold in their stores, the impact is as dramatic as a legislative or regulatory ban. In a sense, the NGOs exist independently of the

normal government process and wield a power all their own.”

“NGOs typically will put pressure on organizations if they feel a real issue is at stake,” said Dan Mohs, CEO of Placon, Inc. “They can be very powerful, mainly through influence on brand owners. They don’t normally direct their concerns at suppliers like Placon, but we know we must engage their concerns. They influence business decisions.”

The NGOs are a fact of life and can be sources of important information about potential problems. “They cannot be ignored,” said Martin. “They are by and large responsible citizens who are trying to do the right thing. The plastics industry can avoid a lot of unnecessary problems by sitting down with them and addressing their concerns. Often they are operating from misconceptions and are amenable to balanced information.”

Some business executives regard NGOs as the equivalent of canaries in a coal mine—early warning signals of potential problems. “Our company would not be where it is today without the NGOs,” said Kevin Petrie, Vice President and Head Procurement Officer for Nestle USA.

“We need to be mindful of them and engage their concern,” said Mohs. “More importantly, we must always take a pro-active approach to make sure our sustainability practices are ahead of the curve. You don’t want to be surprised by this stuff.”

The very qualities that make plastic so useful in a variety of applications—particularly its strength and durability—make it an issue for the environment. Plastic is mostly a petroleum product, and as such uses energy. Though plastic does in fact degrade eventually, it takes more time than many other materials. Discarded plastic containers are eyesores in many places. They take up space in landfills. And there is growing concern about discarded plastics in the oceans.

There is no question that there is tremendous concern among the public about plastics in the environment. A global study earlier this year commissioned by Tetra Pak of some 6,000 consumers in 12 countries, found that more than three quarters say that environmentally sound packaging has an impact on the beverage brand they buy. A full 89 percent of respondents prefer to buy products in packages they know to be recyclable. At the same time, other polls show that a significant percentage of consumers have doubts about recycling saying they are not always certain a particular item actually is recyclable, and six percent in one poll said they do not believe the items they set aside for recycling actually are.

The Tetra Pak survey confirms that consumers are genuinely concerned about the impact of plastic packaging materials on the environment. Two-thirds say they have bought environmental products even when they cost more, and about the same proportion say they have avoided certain products because of environmental concerns. Interestingly, concerns were highest among developing nations like China, Turkey, Brazil and India where 60 percent said they always look for environmental information on the beverage products they buy, compared to 25 percent in the United States, United Kingdom and Japan.

## Reality Check

Concerns about plastic packaging include three areas of concern: it is made from a non-renewable resource, the contribution of plastic packaging waste to landfills and the growing concern about discarded plastics in the oceans.

Many consumers fail to realize the relatively low environmental impact that plastics have during the manufacturing and use phase of life compared to alternative materials.

For example, let's compare the production of paper bags to plastic bags.

It is obvious, or at least should be, that if plastics were not used for packaging, something else would be—and the obvious candidates being paper, cardboard, glass and metal. In 2014, the well-respected research firm of Franklin Associates released a study with the somewhat unwieldy title of *Impact of Plastics Packaging on Life Cycle Energy Consumption & Greenhouse Gas Emissions in the United States and Canada*. The study addressed six categories: caps and closures, beverage containers, other rigid containers, carrier (or shopping) bags, stretch or shrink wrap, and other flexible packaging which altogether accounted for 14.4 million metric tons of plastic packaging in 2010.

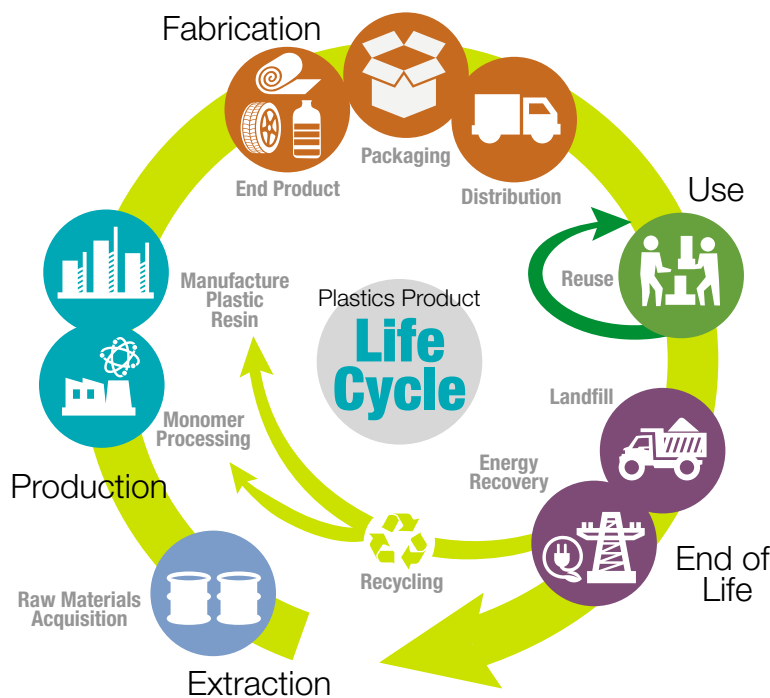
IMPACT OF PLASTIC VS. PAPER				
	Material consumption kg	Greenhouse kg CO <sub>2</sub>	Abiotic depletion kg Sb eq	Eutrophication kg PO <sub>4</sub> —eq
HDPE Singlet	3.12	6.13	0.102	0.00246
Kraft Paper	22.152	30.2	0.285	0.0266
Impact Area	Ratio of impact Plastics vs. Paper			
Material consumption	1:7			
Greenhouse Gas CO <sub>2</sub>	1:5			
Abiotic depletion	1:2			
Eutrophication	1:10			

Source: James & Grant, Centre for Design at RMIT University, Australia, <http://infohouse.p2ric.org/ref/12/11919.pdf>

If other types of packaging were used to substitute for U.S. plastic packaging,” the study said, “more than 64 million metric tons of packaging would be required. The substitute packaging would require 80 percent more cumulative energy demand and result in 130 percent more global warming impacts, expressed as CO<sub>2</sub> equivalents, compared to the equivalent plastic packaging.”

Overall, plastics packaging is estimated to account for just 1.5 percent of oil and gas use. Also, the chemical building blocks for plastics raw materials are derived from by-products of the refining process that would otherwise have no other uses. In addition, while most oil and gas is consumed in transport and heating, the utility of that used in plastics is extended by recyclability of plastics and the potential for recovering its energy content at the end of its life in waste to energy plants. Plastics can be recycled

**If other types of packaging were used to substitute for U.S. plastic packaging, more than 64 million metric tons of packaging would be required.**



six or more times before its properties are weakened. At the end of its life, plastics packaging can be submitted to energy from waste schemes. Plastics have a high caloric value. A mixed basket of plastics products made from polyethylene and polypropylene, for example, would at 45 MJ/kg have a much greater net caloric value than coal at 25 MJ/kg.

### Recycling and Landfills

Today, more than 94 percent of Americans can recycle bottles, and more than 60 percent can recycle other types of rigid plastic containers and lids. However, recovery rates for PET and HDPE bottles continue to hover around the 30% mark, and had remained relatively stagnant for nearly a decade. Some of the stagnation

can be attributed to light weighting, so more over all units of bottles are being recycled by the overall weight of that recycled material has remained the same. While film is not widely accepted through curbside recycling programs, more than 91 percent of Americans can recycle plastic bags locally at one of 18,000 locations across the country, primarily at major grocery and retail chain stores, and another 71 percent can recycle other types of flexible polyethylene wraps.

For all that, the EPA reports that the overall recycling rate for various forms of plastics is only 13 percent. The rate for some plastic products is much higher. For example, in 2013, 28 percent of HDPE bottles and 31 percent PET bottles and jars were recycled. Even so, there is more to be done. "While that is the calculated recycling rate for post-consumer plastics found in municipal solid waste, the overall recovery rate for plastics is much higher, likely around 25 percent if you calculate plastics that also go to some form of energy recovery," said Kim Holmes, SPI's Senior Director of Recycling and Conversion. "Traditional mass burn incineration has long been the energy recovery option for MSW [municipal solid waste], however new technologies are emerging that can convert different waste streams into valuable new products." Gasification and pyrolysis technologies are nearing commercialization in the U.S. as a viable alternative to treat plastics that cannot technically or economically be mechanically recycled. These systems are cheaper to construct, easier to permit and smaller in scale than traditional waste-to-energy incineration facilities. These technologies are gaining momentum in Europe, and it is to be hoped they will find traction in the U.S. in the next decade.

"There are types of technologies we need to look at to increase the recovery rate for plastics," said Holmes. "Tradi-

tional recycling and conversion to energy recovery can be complimentary within a holistic framework to enhance overall recycling."

One difficult challenge is what to do with all those plastic bags out there. Some local jurisdictions, such as Montgomery County, MD, require retailers to charge customers 5 cents for each plastic bag used, thus encouraging them to use fabric bags to carry their goods. Last year the Dow Chemical Company conducted a pilot program, Energy Bag, in Citrus Heights, CA. Co-sponsored by Republic Services, the recycling company for Citrus Heights and the Flexible Packaging Association, the program asked 27,000 households to collect in bright purple bags, any plastic items not currently available for recycling in the city. "The pilot program demonstrated we are able to collect, sort and process non-recyclable plastics packaging that would normally go into the regular trash to create a useful energy resource," said Jeff Wooster of Dow Chemical. "Now we are looking for other communities to replicate that experiment and forge an on-going system."

"All plastics should be seen as a resource," Holmes said. "After they have used their initial purpose, we want to make sure they go on to the highest and best use."

EPA reports that plastics make up almost 13 percent of the municipal solid waste (MSW) stream, a dramatic increase from 1960 when plastics were less than one percent of the waste stream. The largest amount of plastics is in containers and packaging, such as soft drink bottles, lids and shampoo bottles. (Plastics recovered from automobiles are treated separately from the MSW data.) EPA reports:

- 33 million tons of plastic waste were generated in 2013, representing 12.8 percent of MSW.
- In 2013, the United States generated about 14 million tons of plastics as containers and packaging, about 12 million tons as durable goods such as appliances, and almost 7 million tons as nondurable goods such as plates and cups.
- In 2013, the category of plastics which includes bags, sacks and wraps are recycled at almost 14 percent.

Plastics for recycling are typically collected from curbside recycling bins or drop-off sites. Most often, they are taken to a material recovery facility where the materials are sorted by plastic type, baled and sent to a reclaiming facility. There, the plastics are further sorted and processed into a highly pure stream of flakes ready for re-extrusion. Recyclers employ a series of sophisticated technology to accomplish this, including optical sorting technologies, density separation, drying systems, metal detectors and more. Once clean, the flakes can be remelted to form pellets, or directly fed into extrusion systems and used directly for manufacturing.

Overall, the U.S. has become increasingly self-reliant and is recycling more plastics domestically. The capacity to process post-consumer plastics and the market demand for recovered plastic resin exceeds the amount of post-consumer plastics recovered from the waste stream. Lower prices for prime resins have softened demand for recycled plastics amongst those customers looking for cost savings. Recycled plastics generally enjoyed a fairly reliable delta in pricing to prime, but the fixed costs associated with recycling have kept the cost of recycled plastics higher, while the price of prime has dropped. The primary market for recycled PET bottles continues to be fiber for carpet and textiles, while the primary market for recycled HDPE is bottles, according to the American Chemistry Council. PET is also recycled into clothing, such as fleece jackets. Recovered HDPE can be manufactured into recycled-content landscape and garden products, such as lawn

chairs and garden edging. Recovered LDPE bags and films are used to manufacture polymer lumber for decks and fencing.

“Sustainability and recycling issues are central to SPI’s mission to pursue zero waste,” said Patty Long, SPI’s Senior Vice President of Industry Affairs and liaison to the SPI Processors Council. “The plastics manufacturing industry works to manufacturing products that materials that can be recycled and reused. Plastics are valuable resources that save consumers money and should not be buried in a landfill.”

## Plastics in the Marine Environment

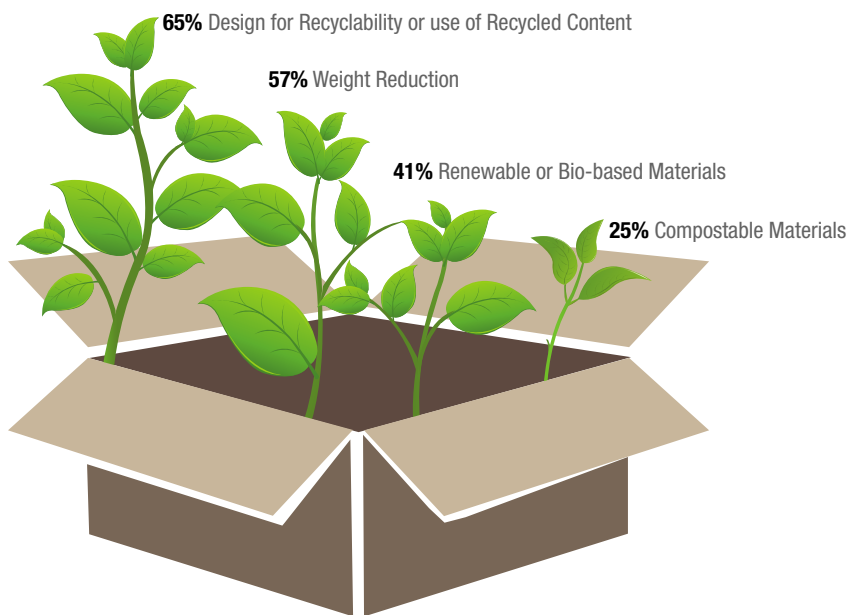
Many, including those in the plastics industry, are concerned about the amount of plastics that end up in the marine environment. Marine debris can impact much more than the appearance of the natural environment—it affects everything from the safety of the tiniest coral polyps, sea turtles and giant blue whales to local economies of people who depend on the sea for a living.

While experts agree that there is no hard data on exactly how much plastic exists in the marine environment or whether the debris’ origin is largely land-based or ocean-based, the University of California Institute of Environment and Sustainability estimates that nearly 20 million tons of plastic marine litter enters the oceans each year. The debris can be traced to many sources including untreated sewage and storm water, weather events like the Japanese tsunami of a few years ago, accidental ship spills, mismanagement of manufacturing facilities and non-biodegradable products.

Because plastics float, they generally receive the bulk of the negative attention surrounding the marine debris issue—despite photographs of the ocean floor littered with glass bottles, aluminum cans, ropes and other marine equipment and refuse. As much as 70 percent of marine debris sinks, according to the United Nations Environmental Program (UNEP), leaving only plastic visible on the surface and light enough to drift in the currents.

## Sustainable packaging

### WHERE MOST SUSTAINABLE PACKAGING EFFORTS ARE DIRECTED



Source: 2011 DuPont survey of global consumer packaged goods manufacturers and converters

A recent report sponsored by the Ocean Conservancy sought to identify the greatest sources of marine debris and found developing countries in Asia have the highest rate of “leakage” of plastics into the environment. The findings underscore the need to work on formalizing waste management systems in developing countries in tandem with increased import and use of packaged products.

## Corporate Innovation

Proctor & Gamble recently announced plans to use more recycled plastic in more fabric care product packaging—in some cases doing from zero to 50 percent—in a move that will impact hundreds of millions of containers. The company said it is reaching out to plastic recyclers around the world to push use even higher. The decision will impact an expected 230 million high density polyethylene and PET bottles annually starting next year. Brands primarily sold in Europe such as Ariel, Dash, Lenor and Unstoppables are all covered by the increase.

P&G already uses some recycled content in packaging for some of the impacted brands, but others will see recycled plastics for the first time. The push toward using more recycled plastics in the company’s fabric care unit is part of a larger overall environmental effort by the company that also includes an end of phosphates in detergents.

P&G’s announcement is in response to growing global public concern environmental consciousness that is a powerful force in the packaging industry and can only expand in the years ahead. As businesses the world over respond to this concern, there will be greater emphasis on recycling and substitution of biodegradable materials for traditional plastics. In the long term, this trend will inevitably impact the use of plastics in a variety of ways and place even more pressure on the industry to respond to environmental concerns.



## America Recycles Day!

America Recycles Day to be observed on November 15 continues a tradition formalized by President Obama in 2009. It has proven to be a popular cause as millions of Americans from coast to coast engage in a variety of activities that celebrate the wide variety of recycling options now available to consumers, and encourages them to participate more actively.

Clearly we are making progress. Between 1994 and 2012, MSW grew by 20 percent in line with both population and household growth. Yet the amount of MSW related to containers and packaging fell significantly during that time period from 36 percent to 30 percent. It is worth noting that back in 1994 EPA forecast that by 2010, packaging-related waste would grow by 32 percent—from 75 to 99 million tons—and account for 38 percent of total MSW.

The 24 million tons of used packaging that didn't show up was primarily due to source reduction, says Robert Lilienfeld, editor of the ULS (Use Less Stuff) Report. In fact, by 1984 light weighting had already made significant strides, and the positive effects continue. EPA estimated that between 1972 and 1992, soft drink containers were reduced in weight by 36 percent for one-way glass bottles, 32 percent for steel cans, 22 percent for aluminum cans and 18 percent for PET bottles.

Also, there were major gains in container recycling. Between 1994 and 2012, the amount of packaging materials recovered grew by 54 percent and the recovery (recycling) rate jumped from 33.5 percent to 51.5 percent. "This is amazing," Lilienfeld said, "especially since most bottle bill legislation had already been passed and implemented by 1989."

The result: thanks to source reduction and recycling, packaging

discards heading to landfills was reduced by a significant 27 percent. On a per capita basis, the reduction was a whopping 39 percent!

"Even if we recycled everything and sent nothing to landfills, it would not slow down the consumption of energy which is the real problem," Lilienfeld said. "Recycling is a feel good activity. Biodegradability by itself means nothing. Technically, waste is supposed to biodegrade in a landfill. No one knows if that happens but if it does, it creates methane gas which is one of the most troublesome greenhouse gases."

## Lifestyle Choices

There is a significant trend afoot that augurs changes in plastics packaging—a growing concern and awareness amongst consumers about quality, freshness and additives in food. This does not directly address concerns about packaging but promises change nonetheless. In this case, a growing number of consumers are concerned about artificial colors and pesticides, preservatives, high-fructose corn syrup, growth hormones, antibiotics, gluten, genetically modified foods and other agents deemed unhealthy or environmentally problematic.

An article in a recent issue of *Fortune* magazine highlighted these concerns expressed last February at the Consumer Analyst Group of New York Conference, the packaged-goods industry's premier gathering. There is growing concern that shoppers are turning away from "big food" out of concern that processed foods are making them unhealthy. Credit Suisse analyst Robert Moskow said that the top 25 U.S. food and beverage companies have lost the equivalent of \$18 billion in market share since 2009. "I would think of them as melting icebergs," he said. "Every year they become a little less relevant."

Steve Hughes, a former ConAgra executive who co-founded and now runs natural foods company Boulder Brands believes so much change is afoot that we won't recognize the typical grocery store in five years. "I've been doing this for 37 years," he said, "and this is the most dynamic, disruptive and transformational time that I've seen in my career."

The consumer search for natural more authentic foods has led organic food sales to more than triple over the past decade and increase last year alone to \$35.9 billion, according to the Organic Trade Association. For each of the last two years, the annual volume of packaged food sold in the U.S. has fallen more than 1 percent. Over the last decade, industry tracker NPD Group has recorded an 18 percent decline in canned-soup consumption at dinner and a 7 percent decline at lunch.

## Conclusion

Fair analysis must consider the full life-cycle of a package and conclude that plastic packaging is a definite plus for the environment and the economy. We contain more products with less plastic packaging than with any other material.

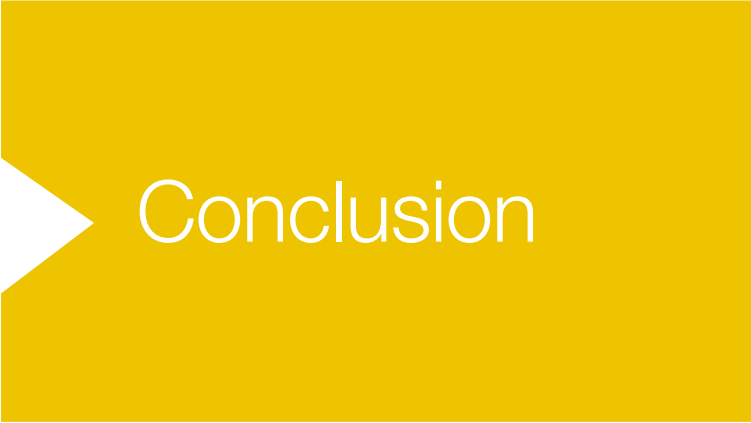
Using less reduces material usage as well as energy consumption through the supply, distribution and value chain. In the meantime, recycling will remain a strong imperative among consumers and the plastics industry is responding to that demand.

**Fair analysis must consider the full life-cycle of a package and conclude that plastic packaging is a definite plus for the environment and the economy.**



The demand for polymers is driven by growth in end use markets, like packaging, mainly from emerging economies.

Plastics  
Packaging  
Wraps it Up



# Conclusion

The global polymer industry is expected to grow with a Compound Annual Growth Rate (CAGR) of 3.9 percent over 2015–2020. The demand for polymers is driven by growth in end use markets, like packaging, mainly from emerging economies. Historically, the middle class has been a major consumer of polymers, and with global population set to include over 60 percent of people within this demographic by 2030, demand for commodity plastics will grow. Polymers are continuously substituting for other materials in various applications due to its lightweight and strength and the design flexibility its offer brand owners along with its low-cost. When it comes to packaging, plastics will continue to replace glass and metals and flexible packaging will continue to replace rigid structures.

Clearly the demand for plastic packaging will increase both in North America and globally. The most significant drivers of this demand are demographics and consumer preferences. Five of the most important consumer packaging market trends range from convenience to traceability.

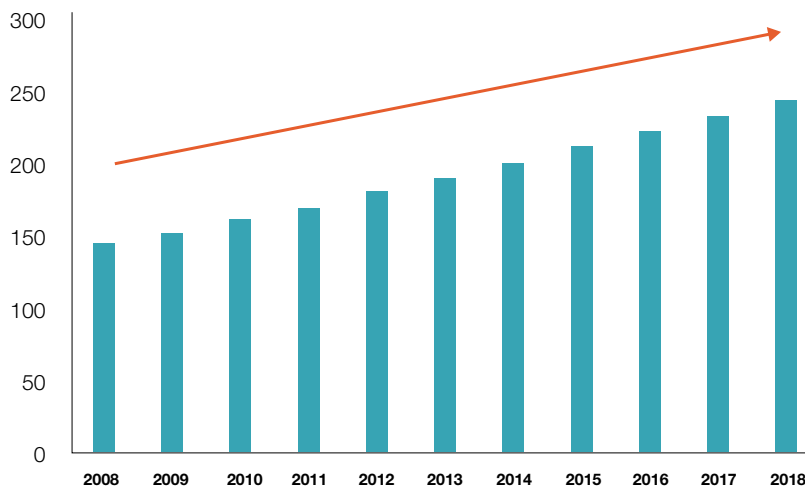
## 1. Sustainability

Consumers are becoming increasingly more aware of global environmental issues and are changing their buying habits accordingly. These days consumers are actively seeking out more green or eco-friendly packaging options. Understanding how commitment to sustainability can be communicated in an engaging way on the packaging is key to attracting, relating to, and keeping consumers.

Sustainability is no longer optional. It is now an essential part of future business planning for those in the packaging industry. The complete story of a product is becoming

### Sustainable packaging is a growing industry

Sustainable packaging market 2008–2018 (\$ billion)



Source: © 2014 H.B. Fuller Company

Sustainability is no longer optional. It is now an essential part of future business planning for those in the packaging industry. The complete story of a product is becoming a key factor in purchasing decisions—where does it come from, how was it made, what are its recycling credentials?

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Consumers will have increased value for recyclability and perceived “greenness” of packaging—at the same time, demand for proof of sustainability claims will grow exponentially, for instance in the demand for life cycle analysis data.

## 2. Healthy Living

The health and wellness sector is booming and has become a key pack-

aging industry trend, reflecting a wider public desire to understand what is and is not good for us. Consumer packaging trends now demand the display of health credentials of the product both quickly and concisely allowing consumers to make informed choices about their food. Regulations often stipulate how this information must be displayed, and packaging must balance these needs. Innovative methods of displaying and preserving fresh food will also be a key factor for short and long term success.

### 3. Convenience

Increasingly busy lifestyles mean that consumers are seeking ease of use and convenient transportation from their packaging. Smaller, lighter and more easily disposable packaging makes consumption-on-the-go easier. Innovations such as no-mess applicators and dispensers eliminate the need for additional packaging, further adding to a no-fuss and disposable approach.

Today's emphasis on "right-sizing" gives way to strategies to use renewable materials, recyclable materials and smart packaging in 10 years—a clear call for innovation and collaboration throughout the value chain.

Right-sizing packaging in terms of efficient package shape/size, down-gauging of package material and minimizing package failures dominate both the North American and European packaging landscape today. Materials play a critical role in these objectives.

### 4. Food Safety and Traceability

As a result of several global food scandals, there is now more demand for transparency between manufacturers and consumers. Origins of products need to be traceable back to their source to re-establish trust throughout the supply chain.

## Five of the most important consumer packaging market trends.



### 5. Cost-Effective Shopping

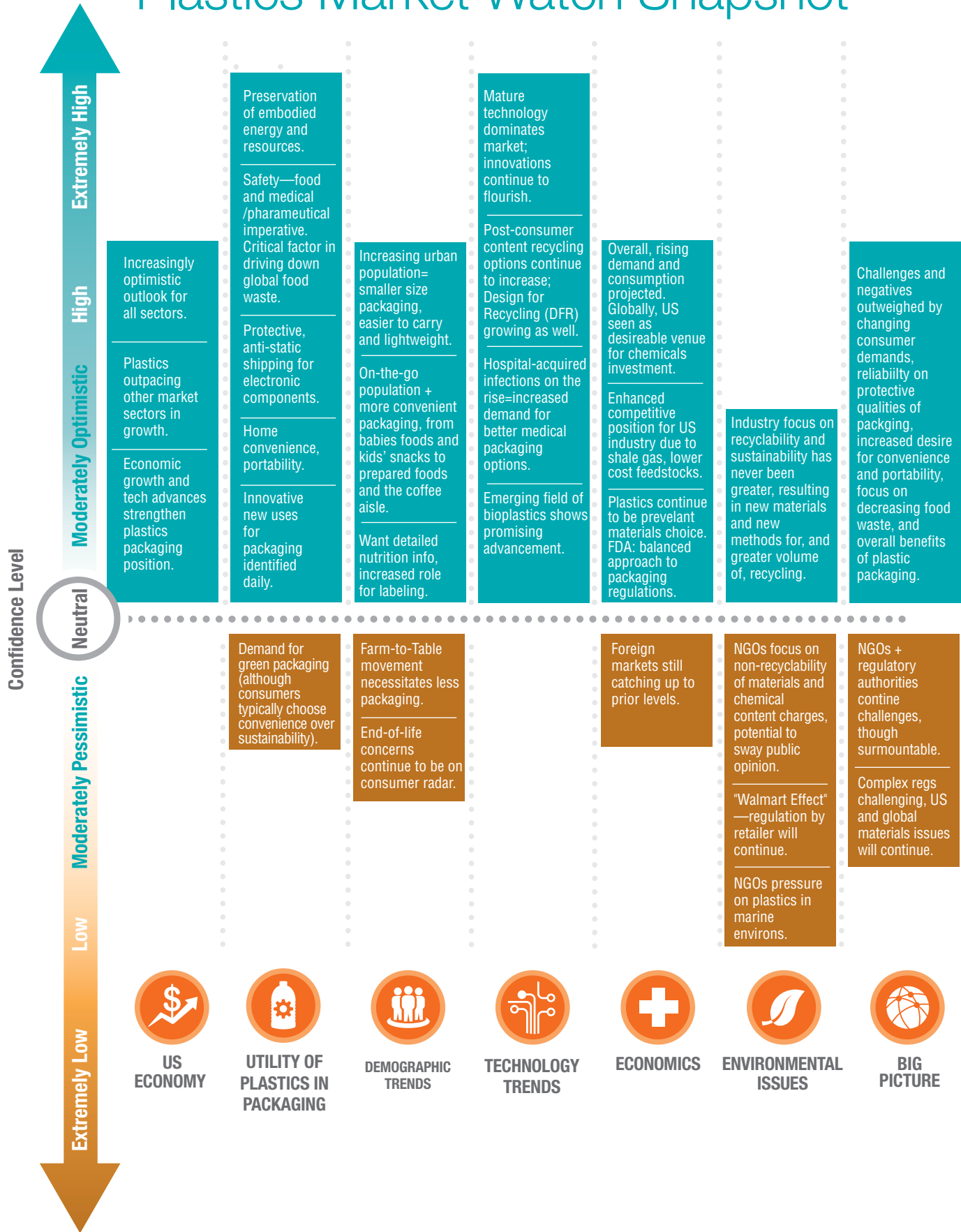
There is no avoiding global economic uncertainty. Understandably, consumers do not want to pay any more than they have to for their packaged goods and that is why cost is and will be one of the key packaging market trends. Cost is one of the first considerations made when making buying decisions.

There is a growing tendency for consumers to make purchases when they are running out of a specific product, as opposed to taking an in advance, 'pantry-loading' approach as has been the norm. Smaller and easier to carry types of packaging therefore hold the greatest potential for these money-conscious, last minute shoppers.

The packaging industry is the biggest single market for plastics in the U.S. and the market is growing. Advancing technology is paving the way for new, more efficient plastics packaging products and more sophisticated manufacturing processes to produce them. Widespread misconceptions about the impact of plastics on the environment are deeply embedded. As yet they have not led to a concerted challenge to the viability of the industry, but where there is deep-seated public concern, there is a possibility of unfortunate laws and regulations that may impact the use of plastics in packaging.

It is imperative that the plastics industry remain alert to news stories and environmental campaigns that demand response. The reality is that a combination of industry efforts to downsize plastic content and promote recycling, along with local recycling and disposal initiatives, have had a tremendous impact on this country's contribution plastics container disposal issues. The challenge should be for the U.S. plastics industry to employ its experience, know-how and progress to other nations that are only now beginning to come to terms with the issues of waste disposal and recycling.

# Plastics Market Watch Snapshot



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