



THE PLASTICS PRIMER

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DISCLOSURES

- No support from commercial interests



ENVIRONMENTAL AND CHEMICAL EXPOSURES

- Traditional environmental pollution is associated with the industrial revolution starting in late 18th century
- Chemicals mostly developed since World War II
- Rubbertown, Louisville, KY

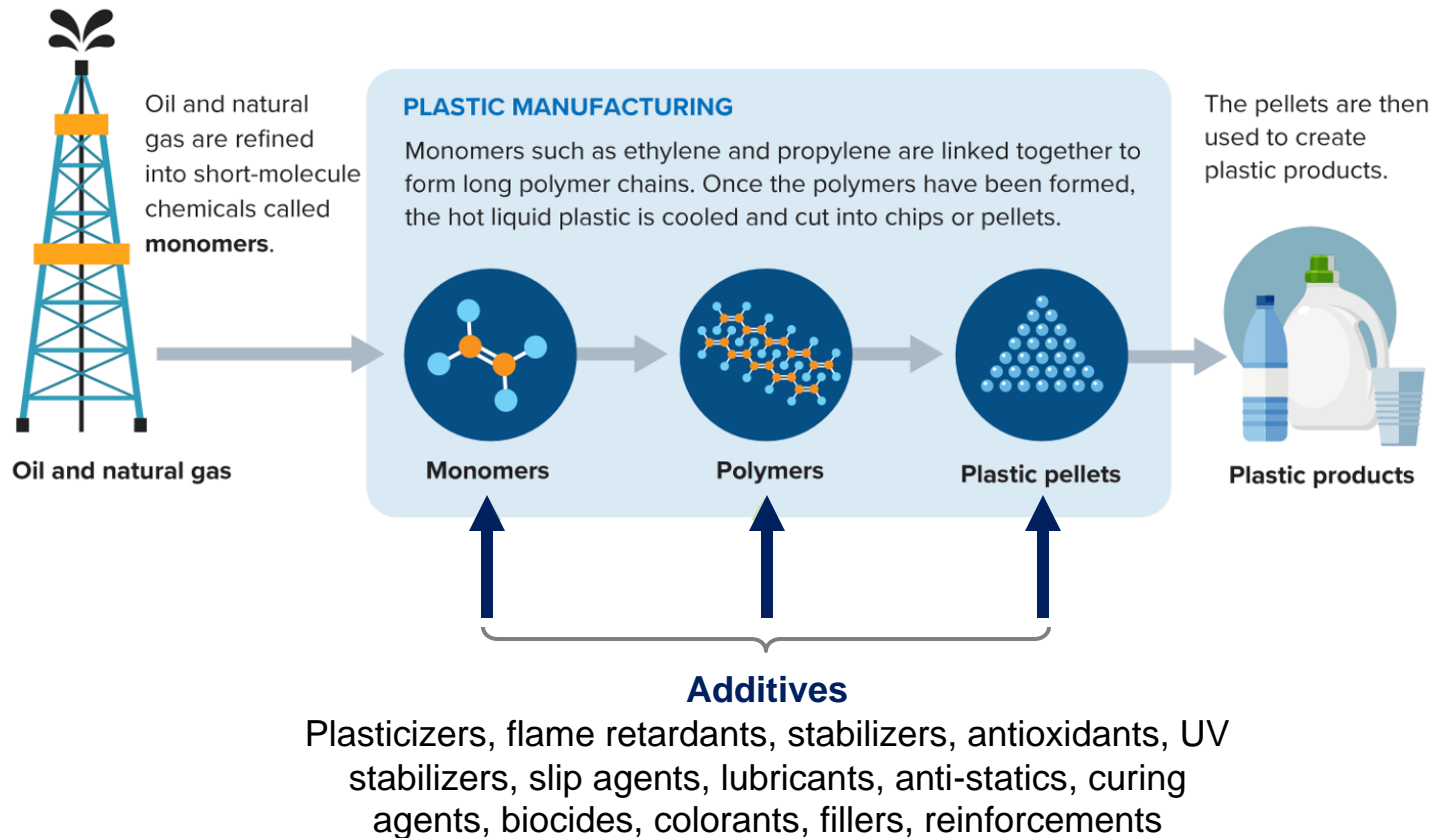


WHAT ARE PLASTICS?

- Any material that can be heated and molded so that it retains the molded shape after it cools
 - Animal horn and amber are examples of natural plastics
- Usually made of petroleum or natural gas
- Unsustainable
- Persistent in environment



HOW ARE PLASTICS USUALLY MADE?



TYPES OF PLASTICS

- **#1 polyethylene terephthalate (PET)** used in bottles, carpets, clothing, and food packaging;
- **#2 high density polyethylene (HDPE)** used in piping, automotive fuel tanks, bottles, toys,
- **#3 polyvinyl chloride (PVC)** used in window frames, flooring, bottles, packaging film, cable insulation, credit cards and medical products;







TYPES OF PLASTICS

- **#4 low density polyethylene (LDPE) or linear low density polyethylene (LLDPE)** used in plastic bags, cling film, flexible containers;
- **#5 polypropylene (PP)** used in food containers, battery cases, bottle crates, automotive parts and fibers;
- **#6 polystyrene (PS)** used in dairy product containers, tape cassettes, cups and plates;
- **#7 Other** oftentimes **polycarbonate (PC)** used in hard shatter resistant reusable food and drink containers. **Polylactic Acid (PLA)** is also #7.



RESIN IDENTIFICATION CODING SYSTEM SYMBOLS AFTER ASTM'S 2013 REVISION

| Resin Identification Number | Resin | Resin Identification Code -Option A | Resin Identification Code -Option B |
|-----------------------------|------------------------------|---|--|
| 1 | Poly(ethylene terephthalate) |  PETE |  PET |
| 2 | High density polyethylene |  HDPE |  PE-HD |
| 3 | Poly(vinyl chloride) |  V |  PVC |
| 4 | Low density polyethylene |  LDPE |  PE-LD |
| 5 | Polypropylene |  PP |  PP |
| 6 | Polystyrene |  PS |  PS |
| 7 | Other resins |  OTHER |  O |



HOW ARE PLASTICS USED?

2004 PERCENTAGE DISTRIBUTION OF RESIN SALES & CAPTIVE USE BY MAJOR MARKET

- **Packaging, 29.9%**
- **Consumer & Institutional, 21.6%**
- **Building & Construction, 18.2%**
- **Transportation, 5.7%**
- **Furniture/Furnishings, 4.0%**
- **Electrical/Electronics, 3.6%**
- **Exports, 11.7%**
- **All Other, 5.3%**



WHAT IS PVC?

- PVC is polyvinyl chloride
- Type of plastic commonly referred to as vinyl
- Used in bottles containing shampoo and hair care products, automotive products, 2-5 gallon size plastic food containers, blister packs



WHY SHOULD WE BE CONCERNED ABOUT PVC?



- PVC requires the addition of numerous chemical additives, which can make the PVC product itself harmful to consumers.
- These chemicals can leach out of PVC, posing risks to children and consumers. New car smell? New shower curtain smell? That's the smell of toxic chemicals off-gassing from PVC.



PVC LIFECYCLE: PRODUCTION

- Chlorinated chemicals used and released during manufacture
- Vinyl chloride- angiosarcoma of the liver
- Pure PVC – 57% chlorine
- Release dioxins and mercury
- Environmental racism
- Worker impacts



Activists block Terminals Pty Ltd, major supplier of feedstock to PVC industry.



PVC LIFECYCLE: DURING USE

- Include harmful additives which off-gas or leach during use.
 - Phthalates – may impair male reprod. system development, liver tumors, etc.
 - Lead, cadmium, organotins.
- Children's toys, IV bags, flooring, food wrap, new shower curtain smell.



PVC LIFECYCLE: DISPOSAL

- As much as 7 billion pounds of PVC disposed of every year in U.S.
- Difficult to recycle - one PVC bottle can contaminate 100,000 recyclable bottles.
- Releases toxic chemicals (i.e. dioxins) when burned in incinerators or in landfill fires.



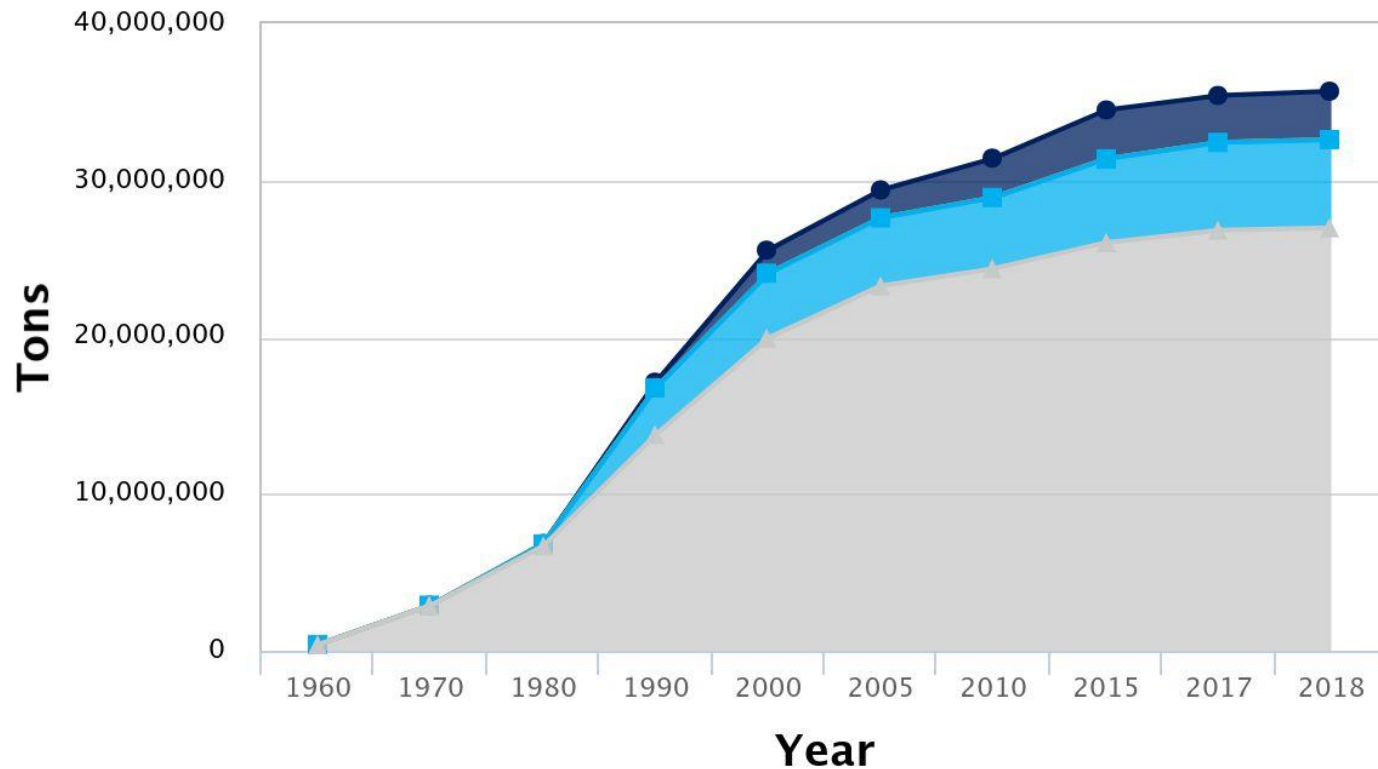
Photo from www.burnbarrel.org



U.S. PLASTICS DISPOSAL (8.7% RECYCLED)

SOURCE: US EPA

Plastics Waste Management: 1960-2018



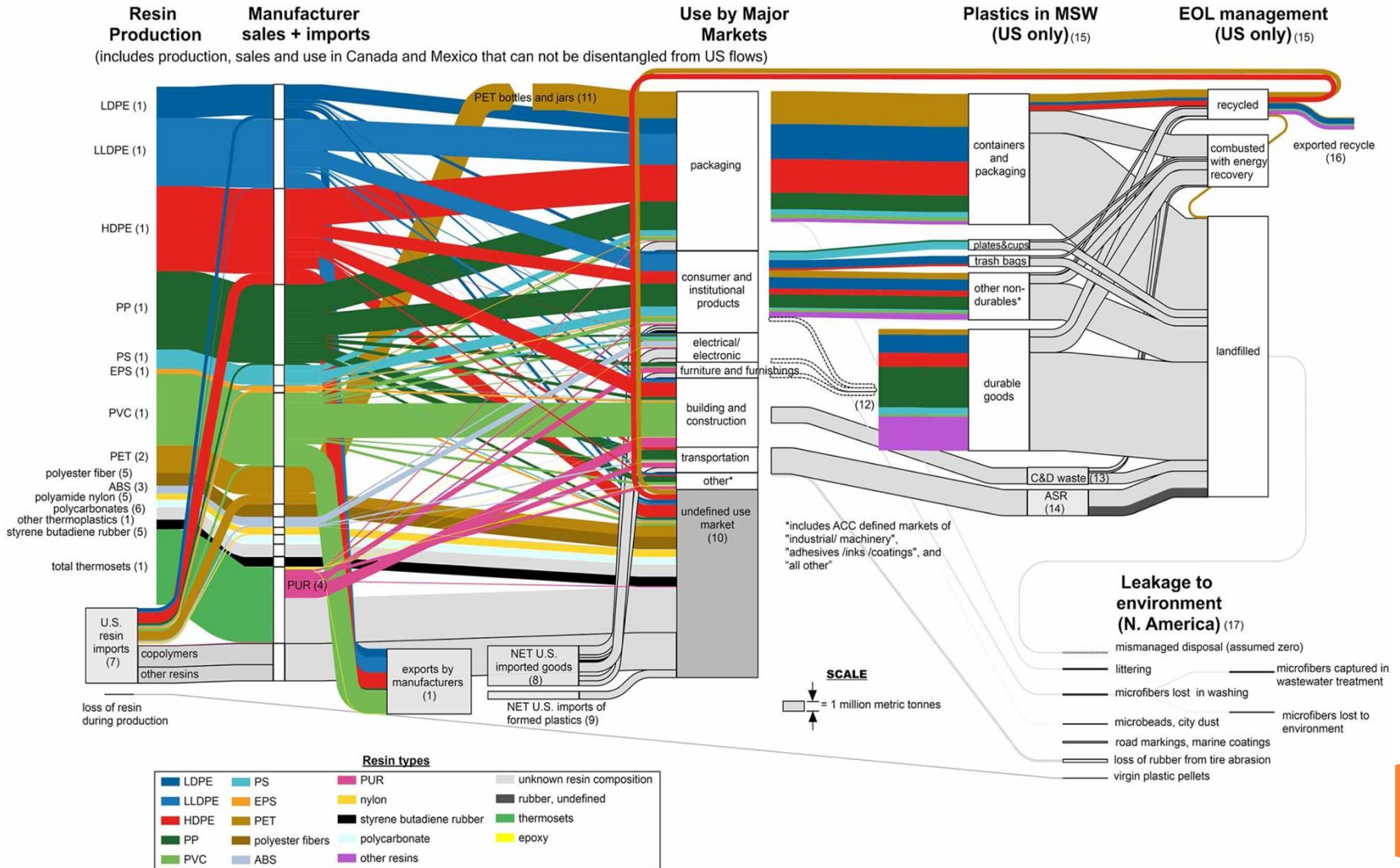
Click on legend items below to customize items displayed in the chart

■ Recycled ■ Composted ■ Combustion with Energy Recovery ■ Landfilled

(<https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data>)



LIFECYCLE OF PLASTIC IN NORTH AMERICA 2017



WHAT ARE THE ALTERNATIVES?

- Safer, cost-effective, alternatives to PVC are readily available for virtually every use.
 - Numbers 1 and 2 plastics
 - Bio-based plastics (polylactic acid-corn, potatoes)
 - Non-plastic alternatives (cardboard, glass, cloth shower curtains)
- Due to community activism, a growing list of companies have committed to phase out PVC products
 - These companies include: Bath and Body Works, Honda, Ikea , Johnson and Johnson, Microsoft, Nike, Toyota, Victoria's Secret, Wal-Mart, Sears, Kmart



WHAT ARE PHTHALATES?

- Plasticizer-additive to Polyvinyl chloride plastic to make it softer
- Emulsifier cosmetics and personal care products
- Found in many PVC containing products
- Health effects-reproductive toxicant, especially in male fetuses and neonates, asthma?, thearchy?



HOW TO REDUCE PHTHALATE EXPOSURE

- Don't buy products in PVC (# 3) containers
- Use natural cosmetics
- Look up specific cosmetics in Skin Deep database
<http://www.ewg.org/skindeep>



WHAT IS BISPHENOL A?

- Previously used as an artificial estrogen before Diethylstilbestrol (DES)
- In polycarbonate (number “7”) and epoxies
- Translucent hard plastic, often colored
- Used in hard plastic
 - reusable food and beverage containers,
 - baby bottles and sippy cups,
 - water bottles and water coolers,
 - thermal cash register receipts
 - the lining of metal cans



HEALTH QUESTIONS ABOUT BPA

Impaired brain development

Hyperactivity

Aneuploidy: Down's Synd.

Prostate cancer

Low sperm count

Long-term memory formation

Dementia

Obesity and diabetes



HOW TO REDUCE BISPHENOL A EXPOSURE

- 70% reduction in 48 hours through diet intervention
- Look for “BPA Free” plastic containers, or “1” or “2’s” (beware of Bisphenol S)
- Better yet, use glass and ceramic containers, especially for acidic and hot foods



HOW TO REDUCE BISPHENOL A EXPOSURE

- Eat fresh foods rather than canned (grow your own)
- Refuse thermal receipts whenever practical
- Cashiers wear gloves, especially if pregnant
- Wash hands after handling receipts and money
- Support legislation to ban BPA



COMPARATIVE U.S. PLASTICS USE

- U.S. is largest producer and largest consumer of plastics
- Annual plastic use in U.S. 306 pounds per capita
- U.S. recycling rates much lower than EU
- CT has good plastics policies
- Fossil fuel plastics do not decay only crumble into smaller pieces
 - Microplastics (1micrometer to 5mm)
 - Nanoplastics (< 1 micrometer)



QUESTIONS?

LET'S KEEP OUR FAMILIES HEALTHY

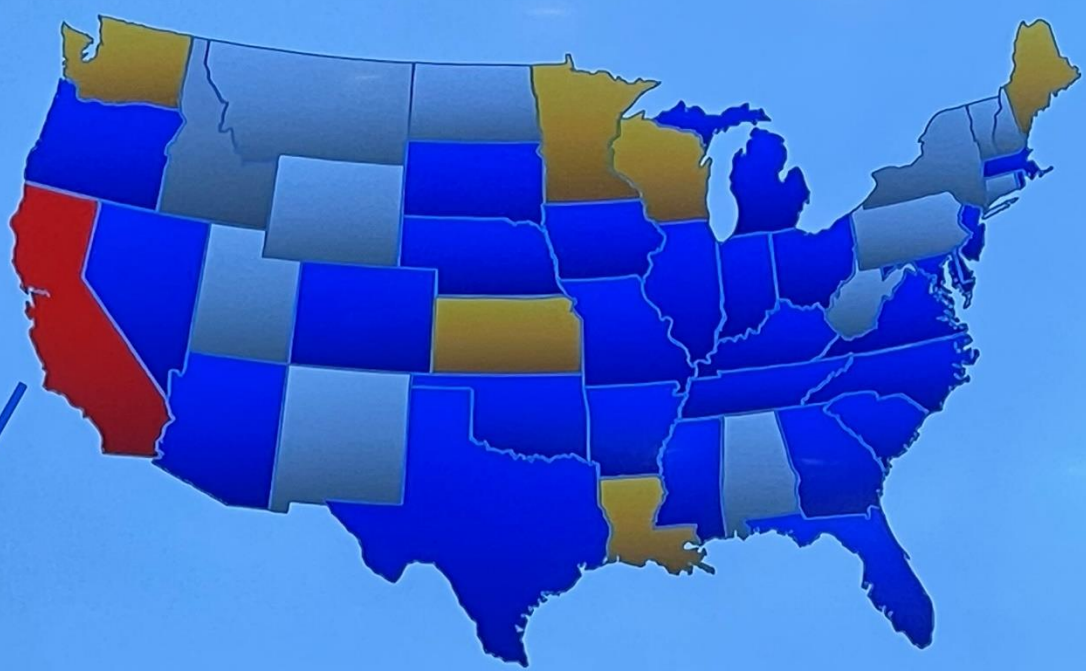


POLICY SOLUTIONS TO PLASTIC WASTE

- Product take-back mandates,
- Landfill/disposal bans,
- Product/material bans,
- Recycled content standards,
- Advanced disposal fees,
- Deposit-refund systems (bottle bills),
- Pay-as-you-throw (PYT) programs,
- Product taxes,
- Virgin resin taxes,
- Tradable permits (cap and trade schemes)



Know the Packaging Claims and Labeling Policy Landscape is Shifting?



- Current law mandates use of resin identification code (RIC) only
- Current law mandates use of RIC with chasing arrows
- New law restricts use of RIC with chasing arrows



a – new law restricts use of chasing arrows symbol if packaging material is determined not “recyclable” under specific “recyclable” criteria – **60% access rates and markets** for curbside collected materials and **60% recycling rate** for curbside/store drop-off materials – 75% after 2030.

– U.S. Environmental Protection Agency (EPA) and Federal Trade Commission (FTC) have signaled some interest