



1 March 2018

Industrial Perspective

Mark Jones

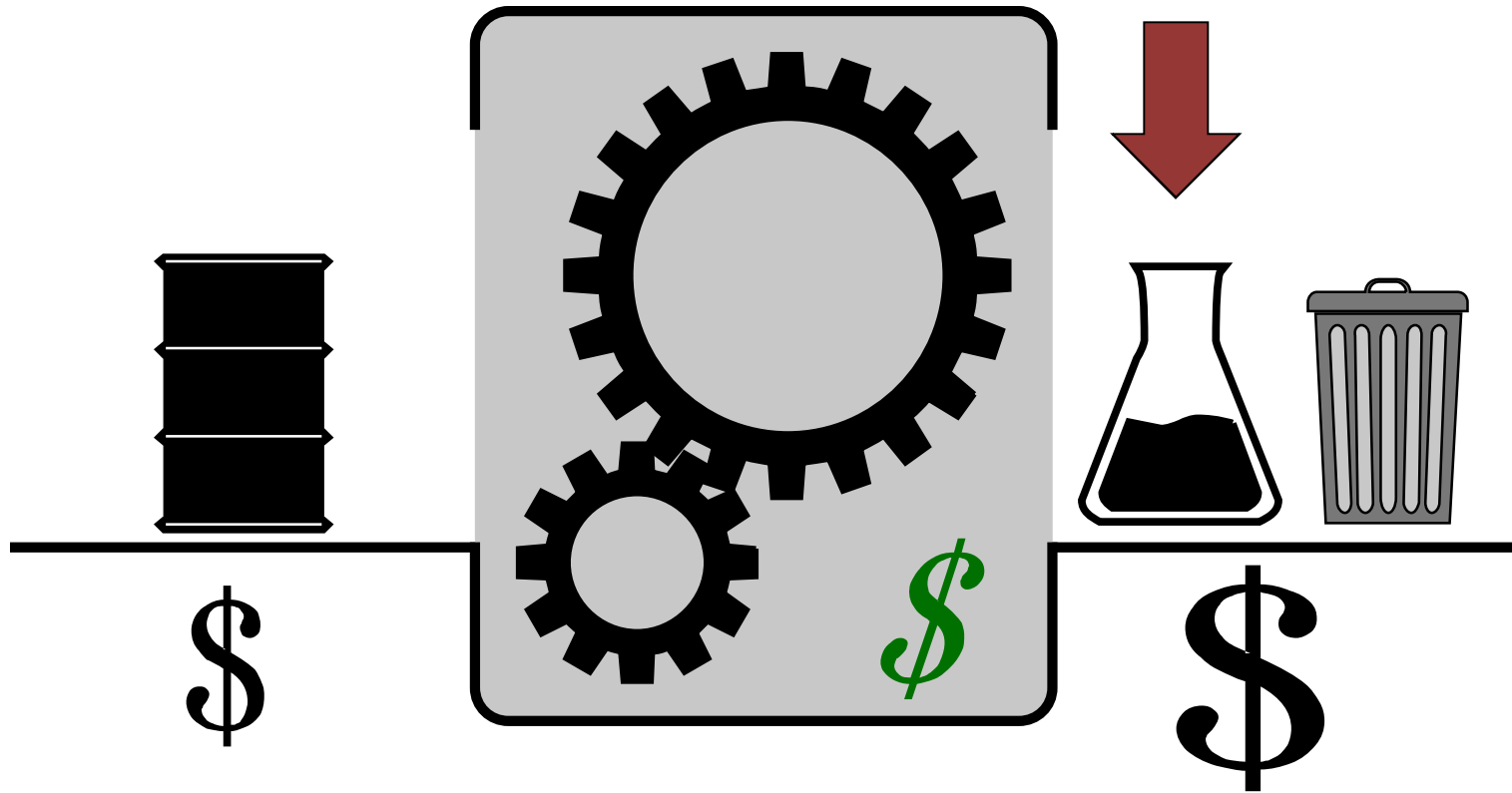
Executive External Strategy and Communications Fellow

The Dow Chemical Company

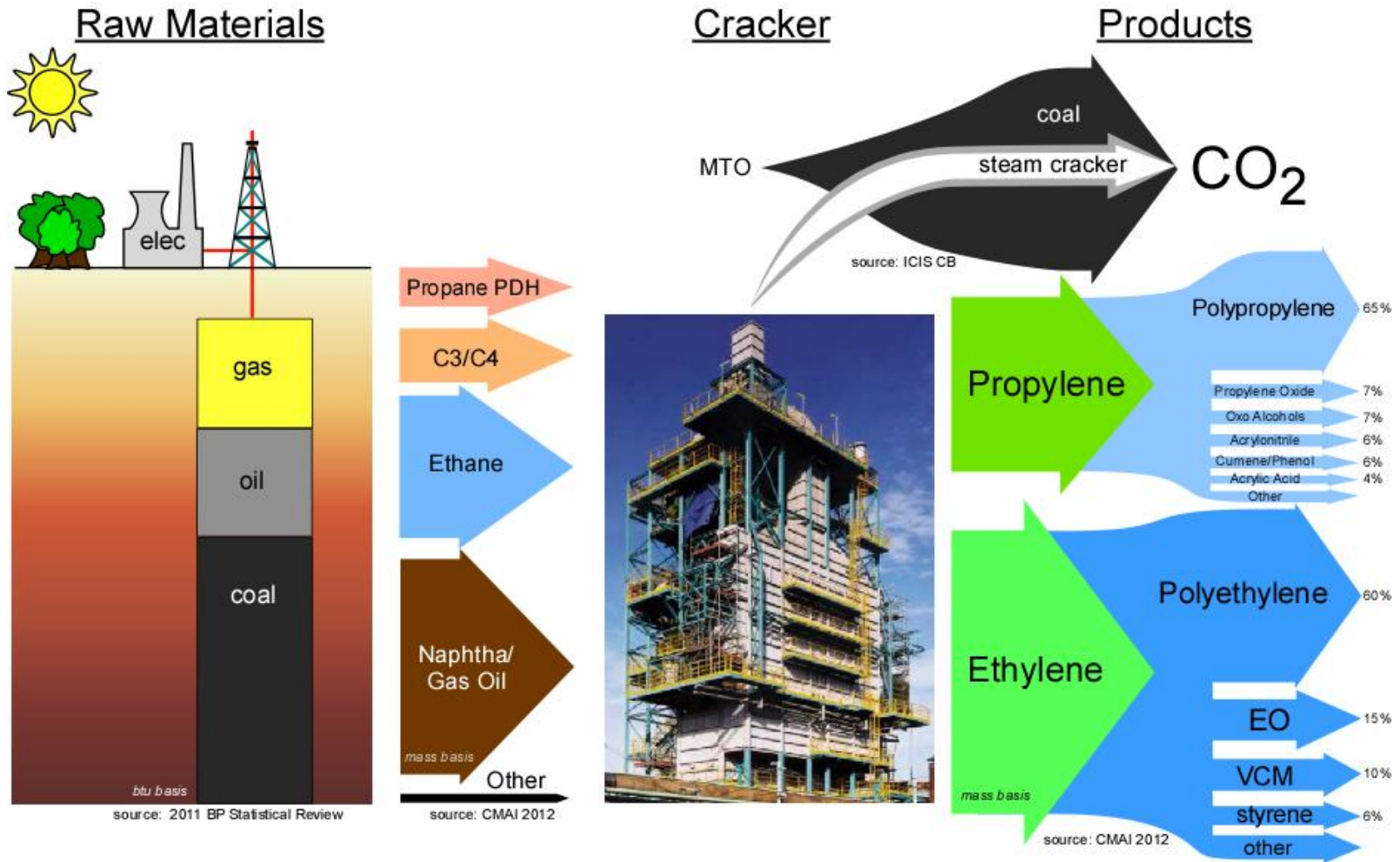
Dow.com/innovation

■ Simplified Chemical Industry

*Major products
are polymers*



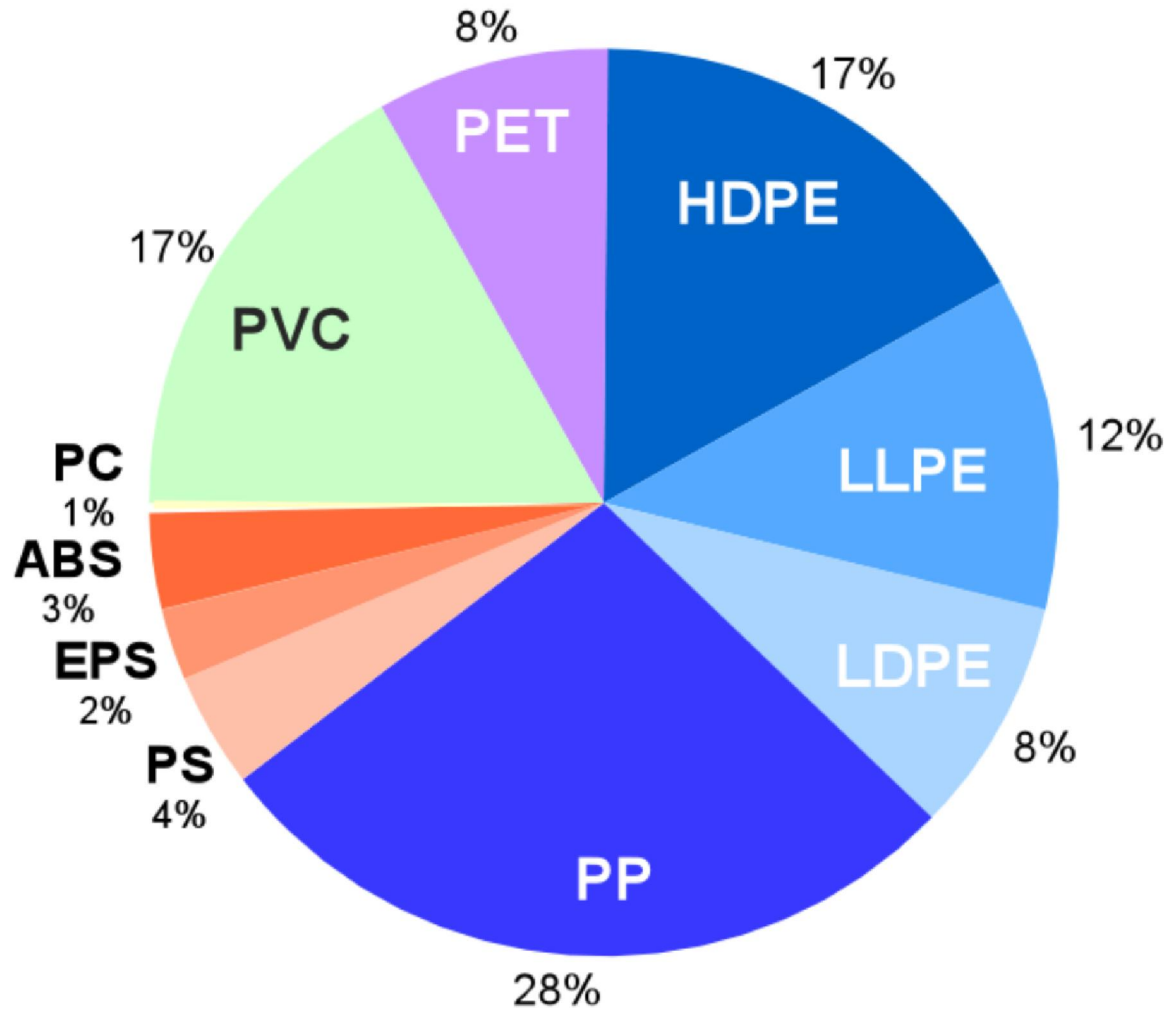
Global Chemical Industry



Polymers

257 Million Tonnes

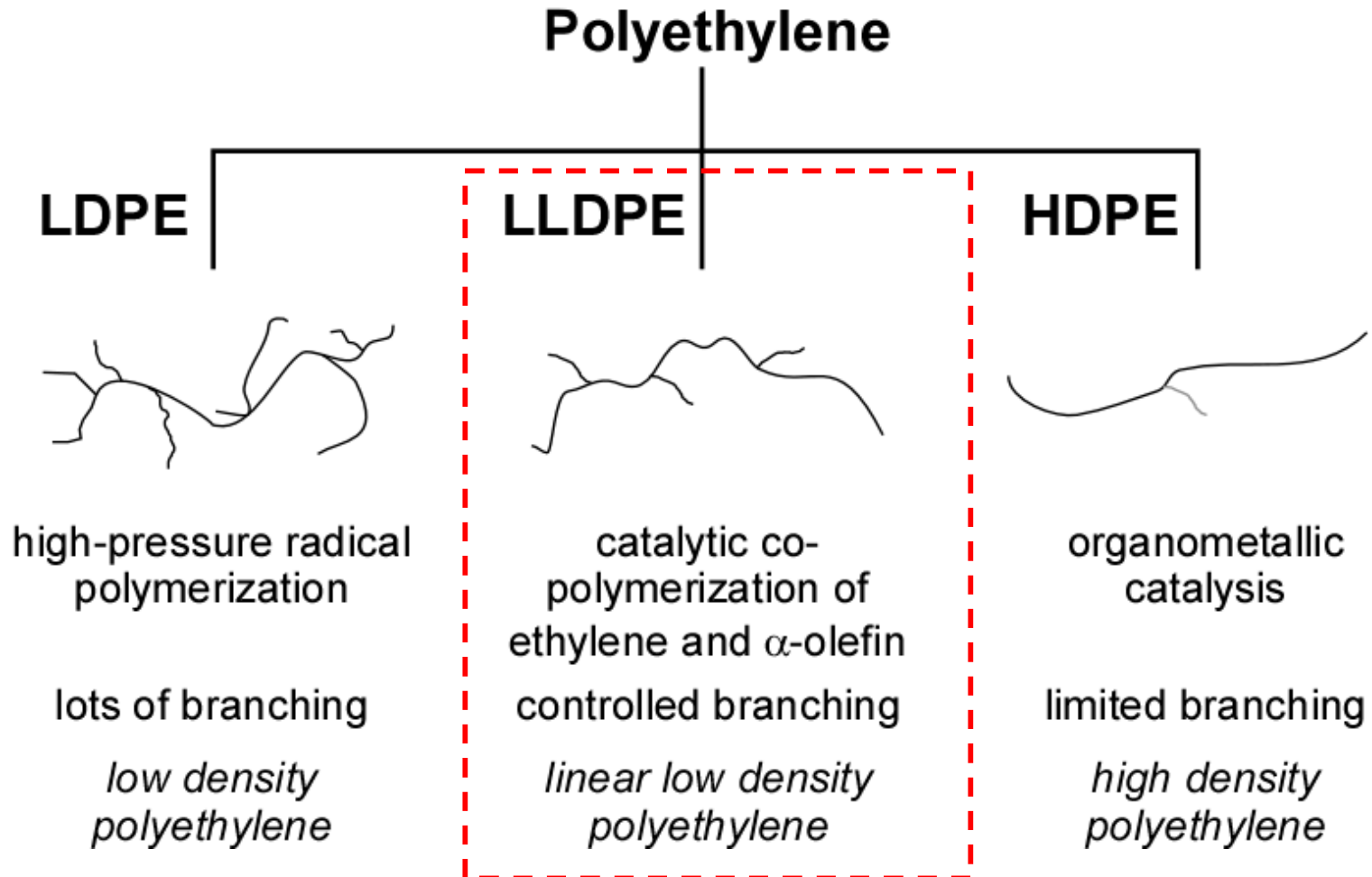
2017 world demand



Source: IHS Markit

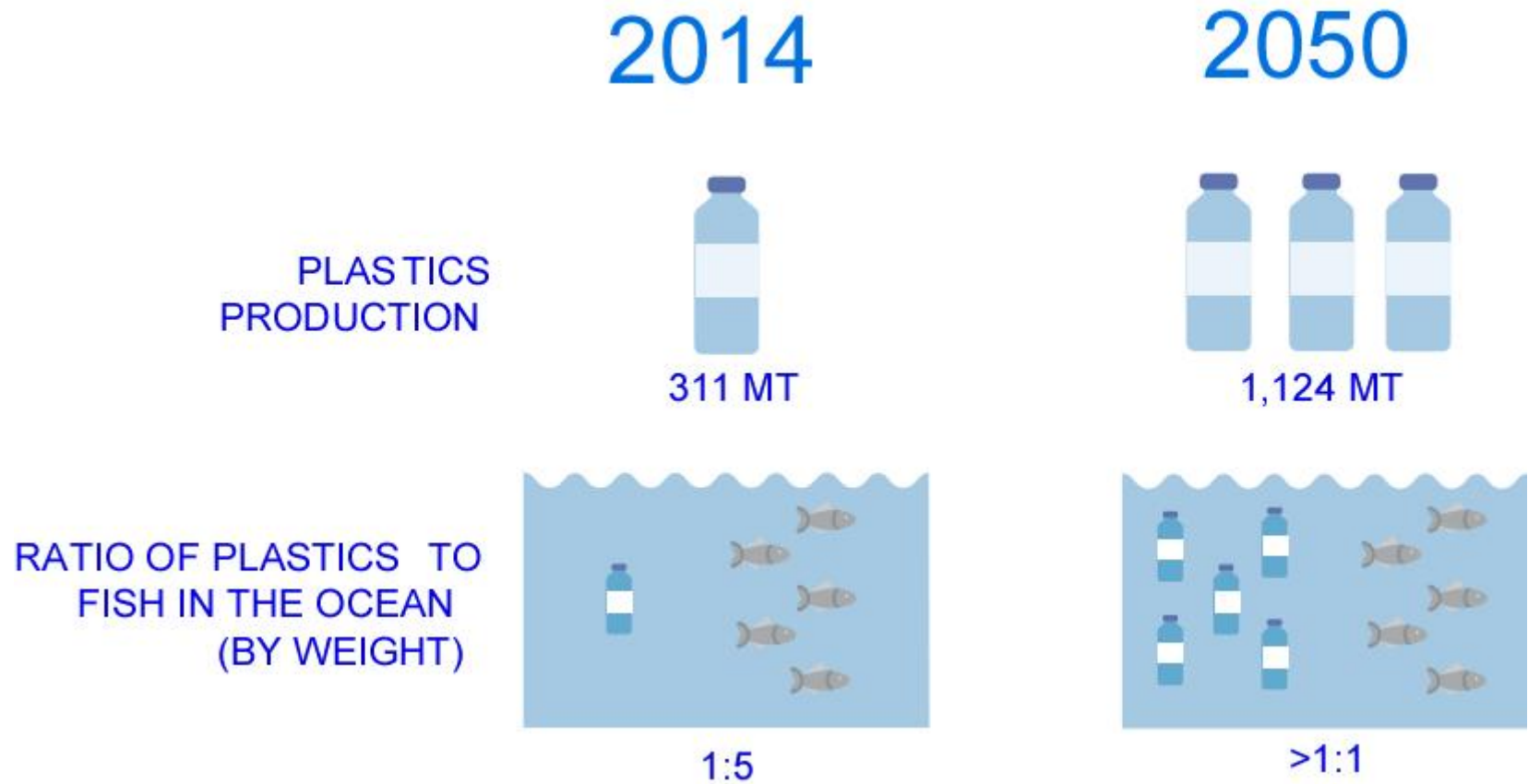


■ Polyethylene





■ Production and Impact



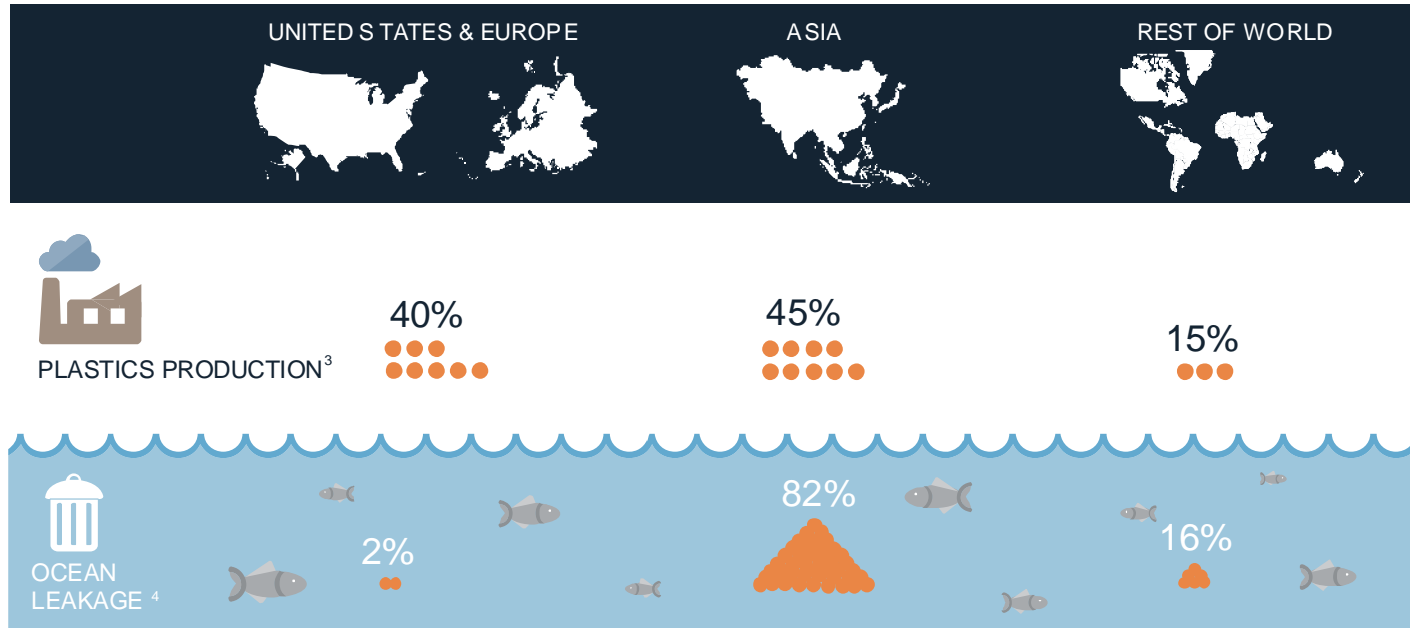
Source: World Economic Forum



Current Plastic Flow



Where Does Plastic Waste Come From?



³ Production of plastics material volumes (excluding thermoplastics and polyurethanes)

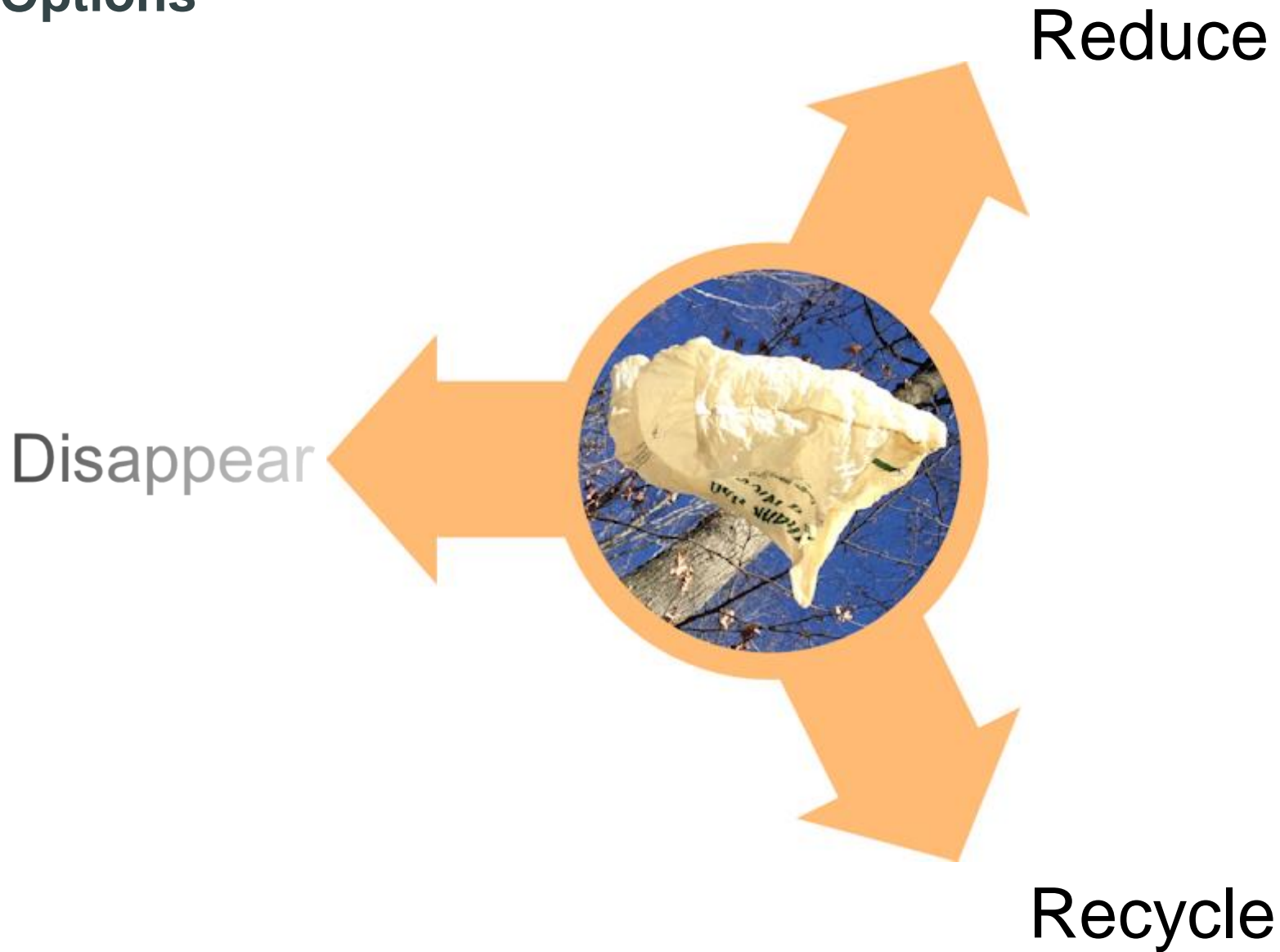
⁴ Source of plastics leaked into the oceans (proportion of the total global leakage measured in million tonnes of plastic marine debris leaked per year)

Source: PlasticsEurope, Plastics – the Facts 2015 (2015); Statista; ICIS Supply and Demand; J. R. Jambeck et al., Plastic waste inputs from land into the ocean (Science, 13 February 2015)

Source: World Economic Forum



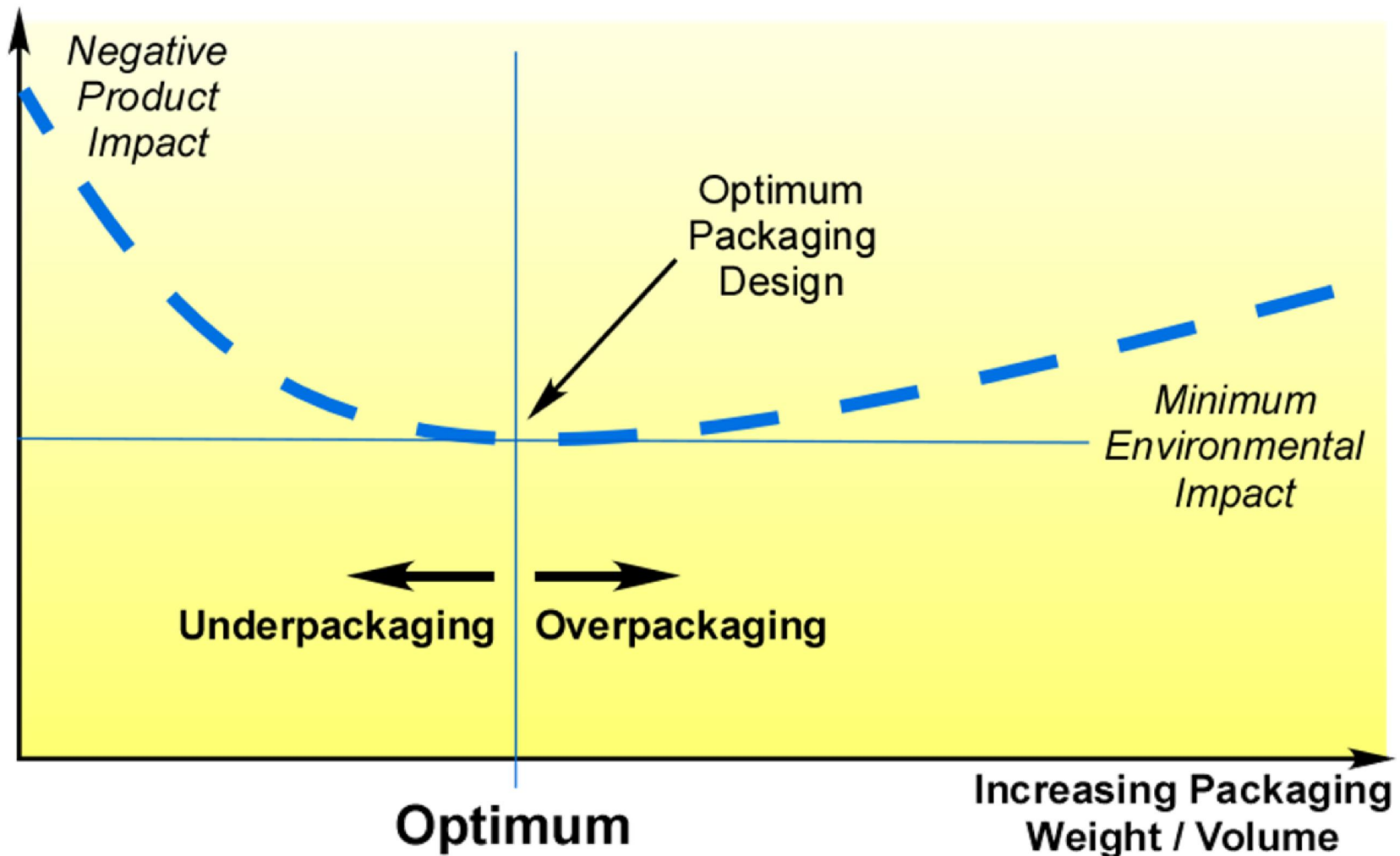
Options



■ Waste Reduction Hierarchy



■ Optimizing Packaging



adapted from Optimal Packaging (The Consumer Goods Forum, Global Packaging Project, 2011)





photo by Mark Jones

Resource Efficient Packaging



EDIBLES

Edible Oils
Ketchup & Other
Condiments
Sauces
Soups
Honey & Syrups
Water & Juices
Dry Pet Food
or Treats

NON-EDIBLES

Paint & Coatings
Detergents &
Cleaning Products
Motor Oil & Fuel
Additives
Seeds
Cat Litter
De-icer Pellets
Fine Aggregates
(filter sand, etc.)



EDISON AWARDS
2015



2015
R&D 100 Winner



■ Recycling



photo by Mark Jones



■ Alternatives to Disposal



photo by Mark Jones

Enabling Recycling

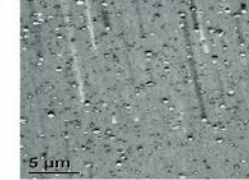


**R&D
100**
54 Years of Invention

Transmission Electron Microscopy

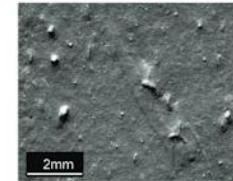


No Compatibilizer
Large EVOH domains

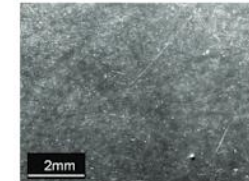


XUS 69 108.01⁽¹⁾
Modifier Polymer
Small, uniform EVOH domains

Optical Microscopy



No Compatibilizer
Large EVOH domains



XUS 69 108.01⁽¹⁾
Modifier Polymer
Small, uniform EVOH domains

Retain™
polymer modifier by **Dow**

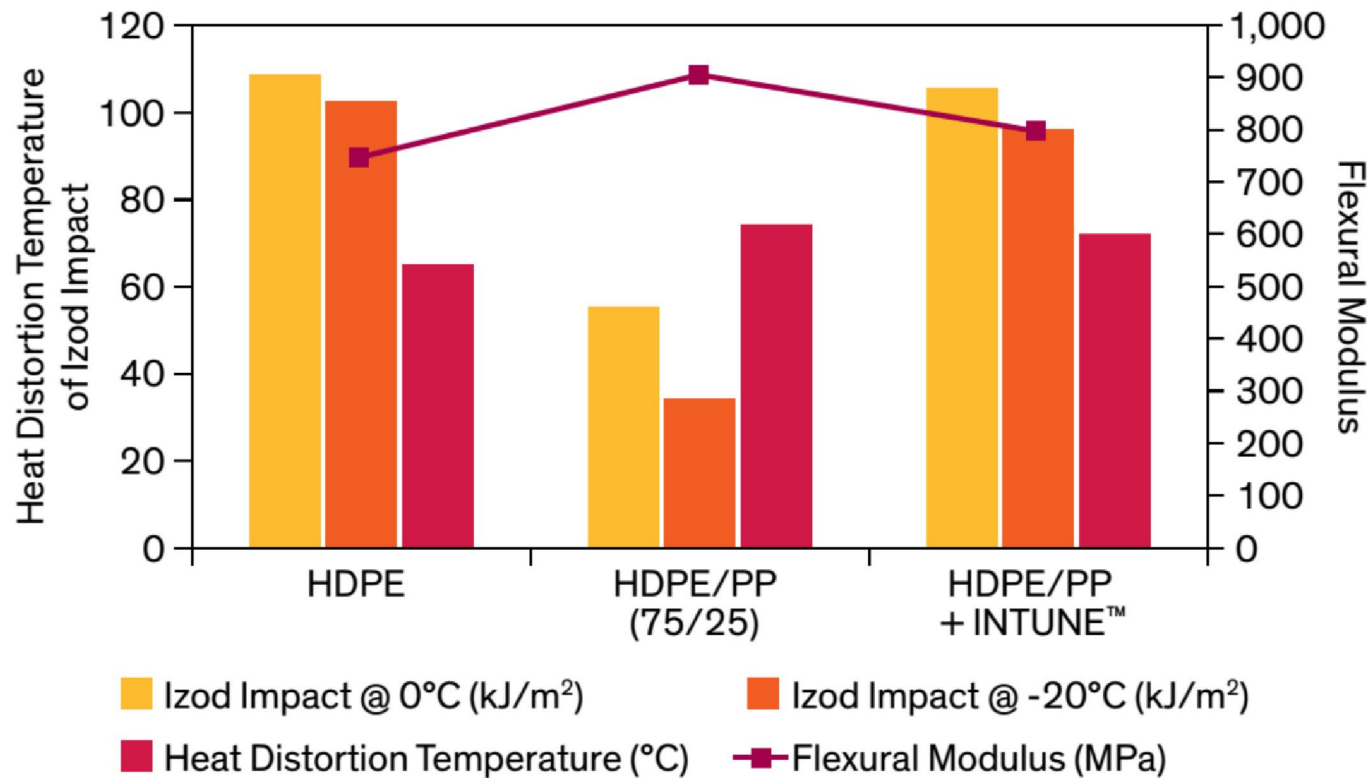


⁽¹⁾Dow estimate per overall barrier figures from *Barrier Materials 2012-2015 Market Report*, Allied Development, 2013.

⁽²⁾Trade mark of The Dow Chemical Company



■ Enabling Recycling



INTUNE™
OLEFIN BLOCK COPOLYMERS



■ Recycling





photo by Mark Jones



Price?



1.6¢



■ Price?

4.2¢



1.6¢



Price?

0.61¢



0.01¢



4.2¢



0.22¢



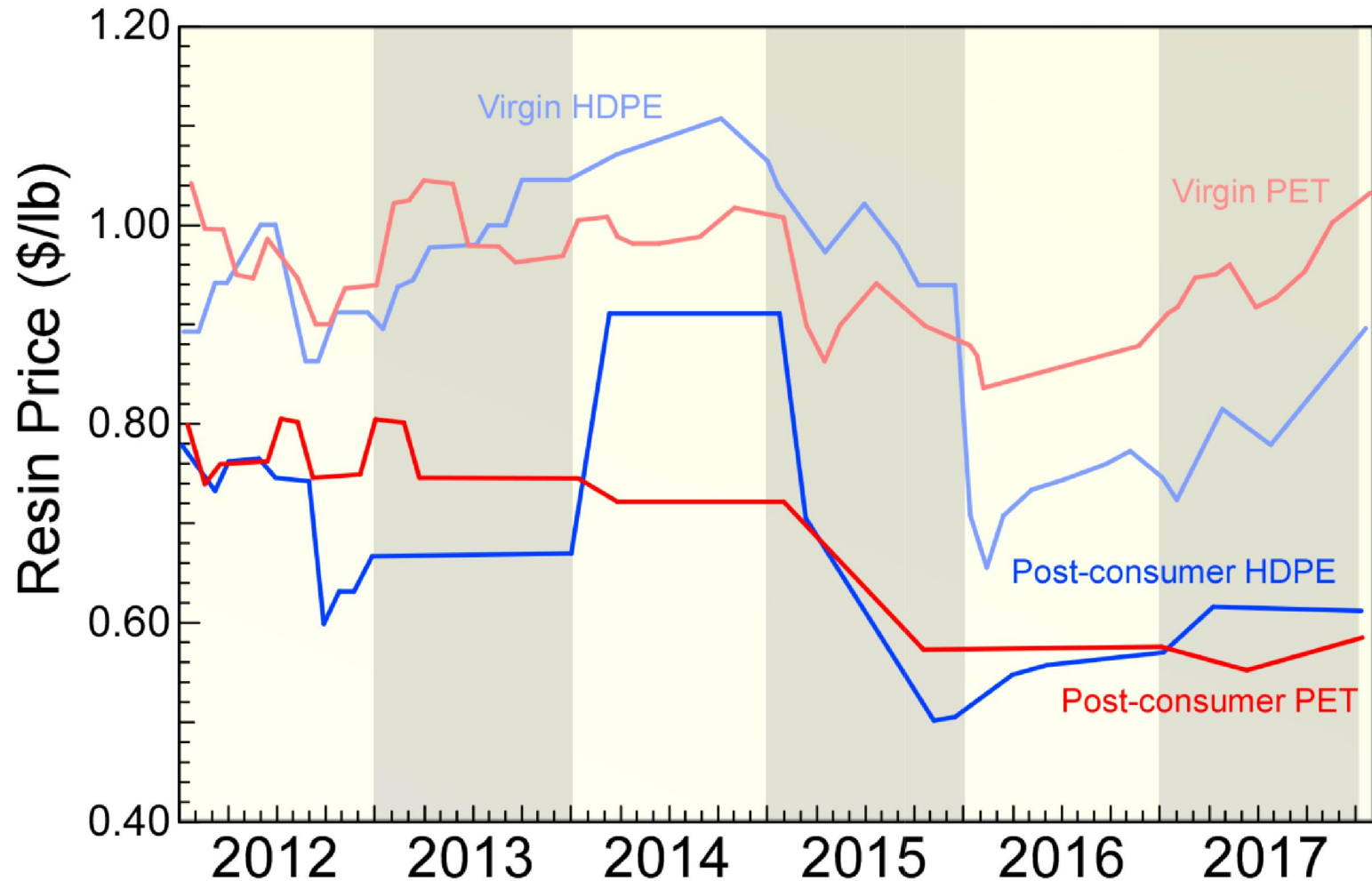
0.20¢



1.6¢



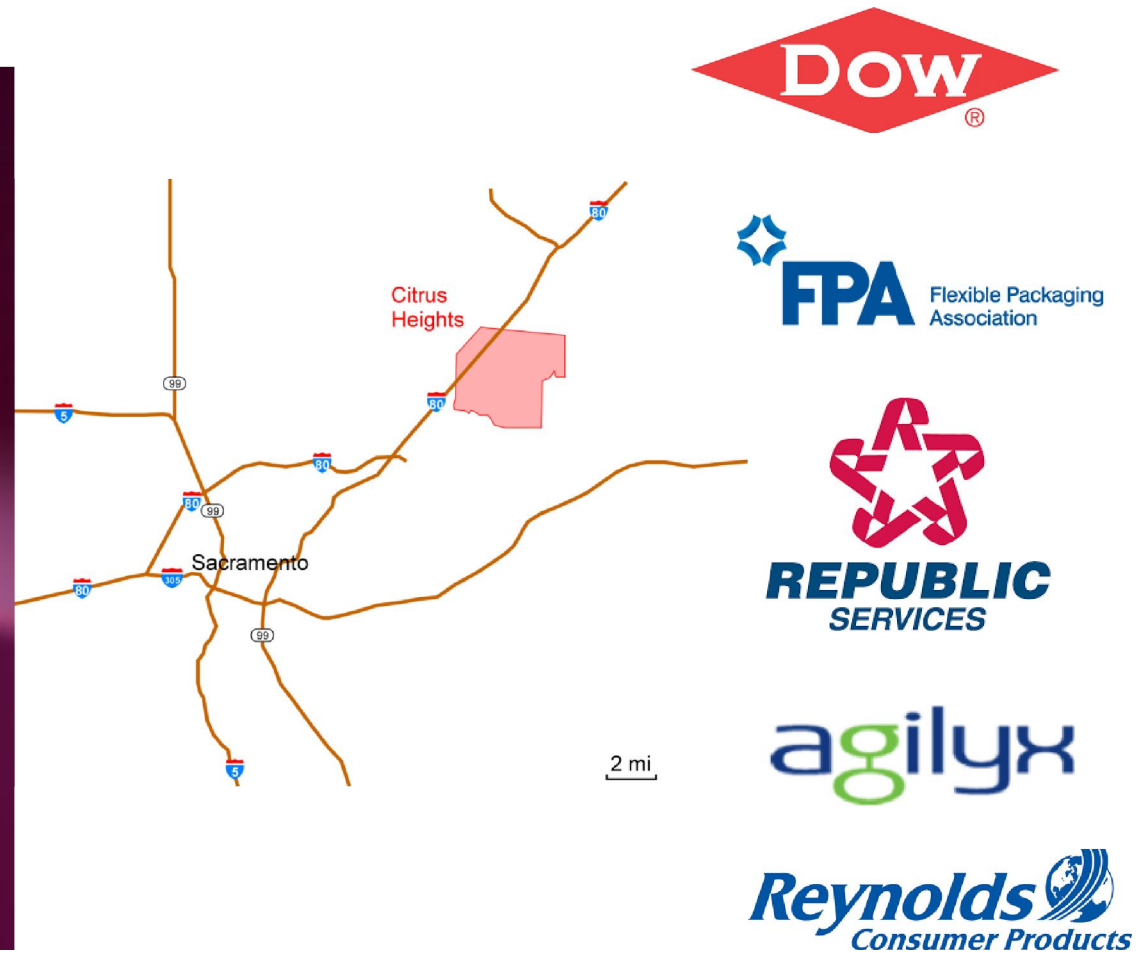
Recycle Pricing



source: Plastics News Market Databook, Dec 2017



■ Improve End-of-Life



■ Improve End-of-Life



THE PLASTICS THAT DON'T GO IN YOUR BIN

GO IN YOUR BAG

- juice pouches
- snack bags
- microwavable pouches
- cake mix liners
- cereal box liners
- laundry pouches
- potato chip bags
- frozen vegetable & fruit bags
- plastic meat & cheese packaging
- squeezable pouches
- foam "to-go" boxes
- foam cups
- salad bags
- plastic cups, plates, bowls & serving ware
- dog & cat food bags
- candy wrappers
- pudding cups
- straws & stirrers
- all other non-recycled bags.



■ Disappear – Option 1

PN

February 22, 2018 UPDATED 9 HOURS AGO

BP predicts plastics bans will impact oil demand

Plastics News Europe



Materials Public Policy Sustainability Materials Suppliers More +



BP plc has predicted that global demand for oil could be impacted by as much as 2 million barrels per day by 2040 due by governments' efforts to regulate products, including bans of single-use plastics.

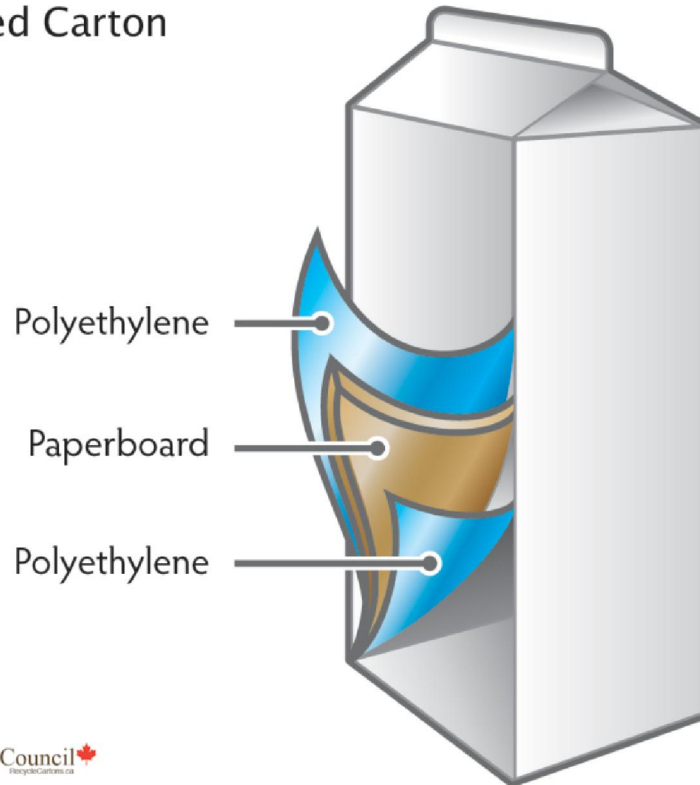
In its latest energy outlook unveiled Feb. 20, BP predicted that oil demand would continue to grow at about 0.5 percent annually through 2040.

According to the British press, commenting on the new outlook, BP's chief economist Spencer Dale said the company believed that regulation against some types of petrochemicals, particularly single-use plastics, would increase in the coming years.

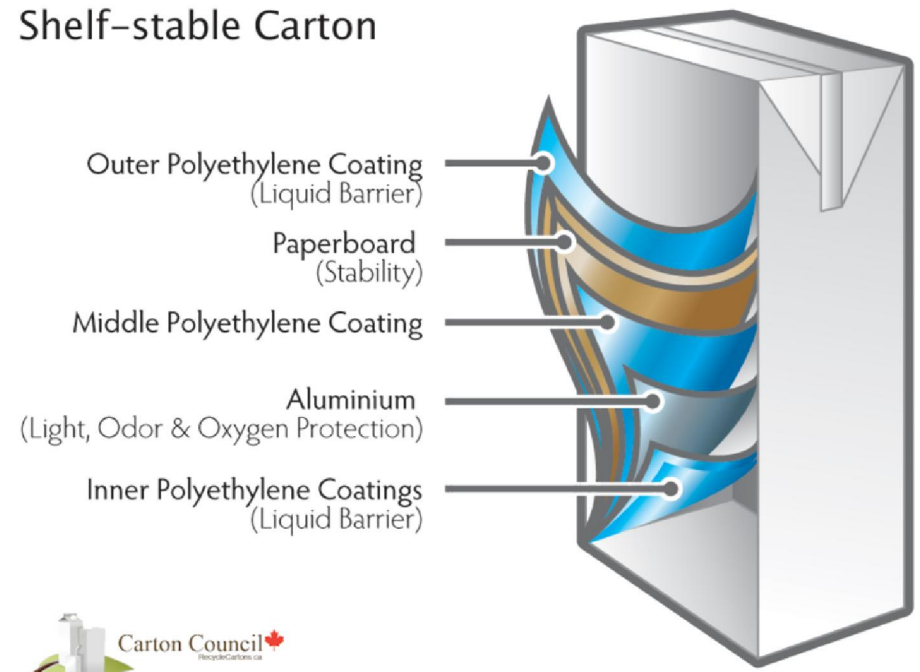


■ Polyethylene Coats Paper

Refrigerated Carton



Shelf-stable Carton



■ Biodegradation

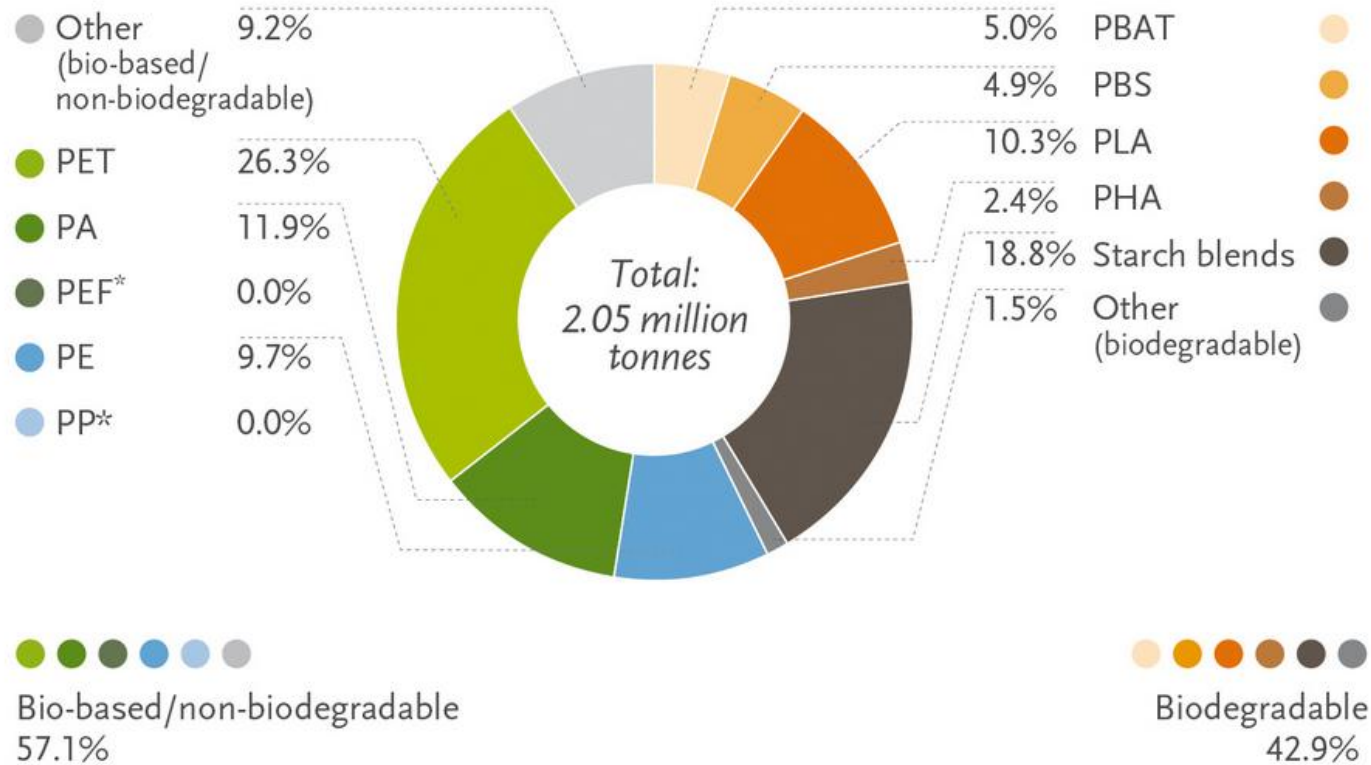


photo by Mark Jones



Disappear – Option 2

Global production capacities of bioplastics 2017 (by material type)



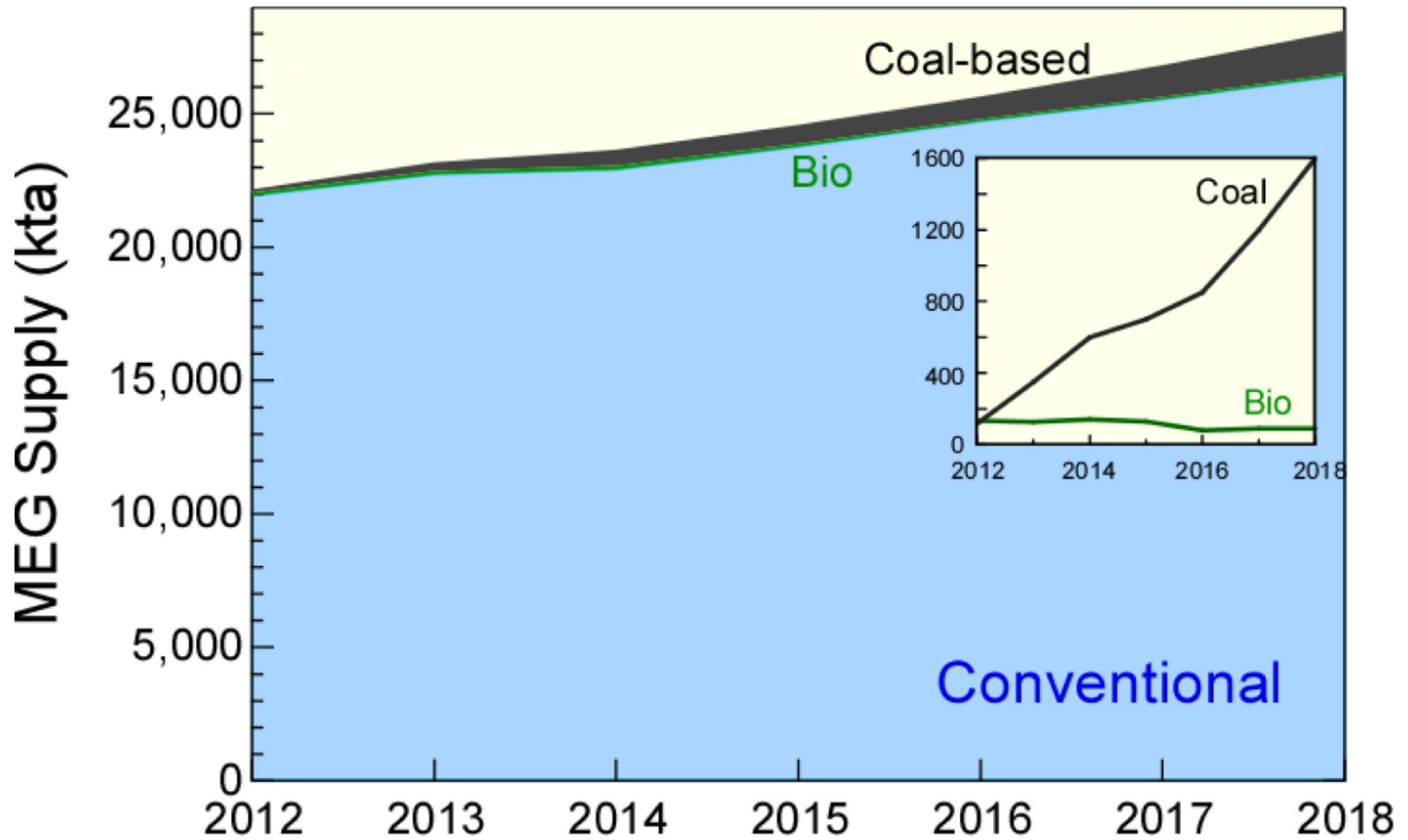
*Bio-based PP and PEF are currently in development and predicted to be available in commercial scale in 2020.

Source: European Bioplastics, nova-Institute (2017).

More information: www.bio-based.eu/markets and www.european-bioplastics.org/market



Reality – MEG production for PET



■ New Options



Credit: [Federica Bertocchini, Paolo Bombelli, and Chris Howe](#)

Bombelli, Paolo, Christopher J. Howe, and Federica Bertocchini. "Polyethylene bio-degradation by caterpillars of the wax moth *Galleria mellonella*." *Current Biology* 27.8 (2017): R292-R293.

Summary



photo by Mark Jones



■ Questions

