

Chicken and Broken Glass:

Driving The Chemical Industry To A More Sustainable Future

Mark Jones

Executive External Strategy and Communications Fellow
The Dow Chemical Company



10 February 2016



glass is nature's safest container

Glass is open, honest, **transparent**.
It lets you see exactly what your baby is eating.

Glass is the ultimate in **sustainability**.
And it's endlessly recyclable.

Made from **pure**, natural minerals,
glass doesn't interact with your food at all.
So you know you're feeding your baby
only real fruits and vegetables.



Try Beech-Nut® real food for babies.
glassislife.com | #chooseglass

“Glass is nature’s
safest container”

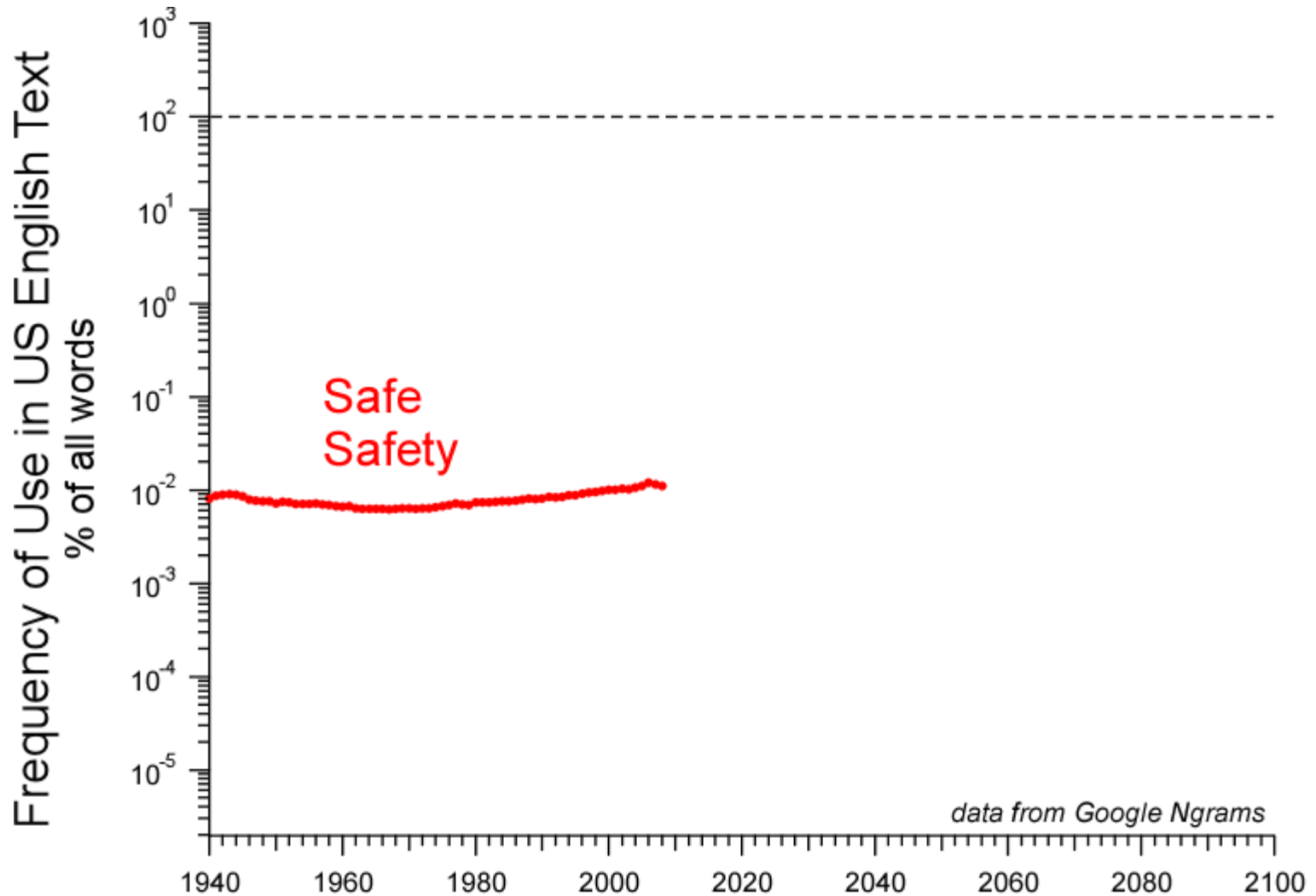
“Glass is the
ultimate in
sustainability”



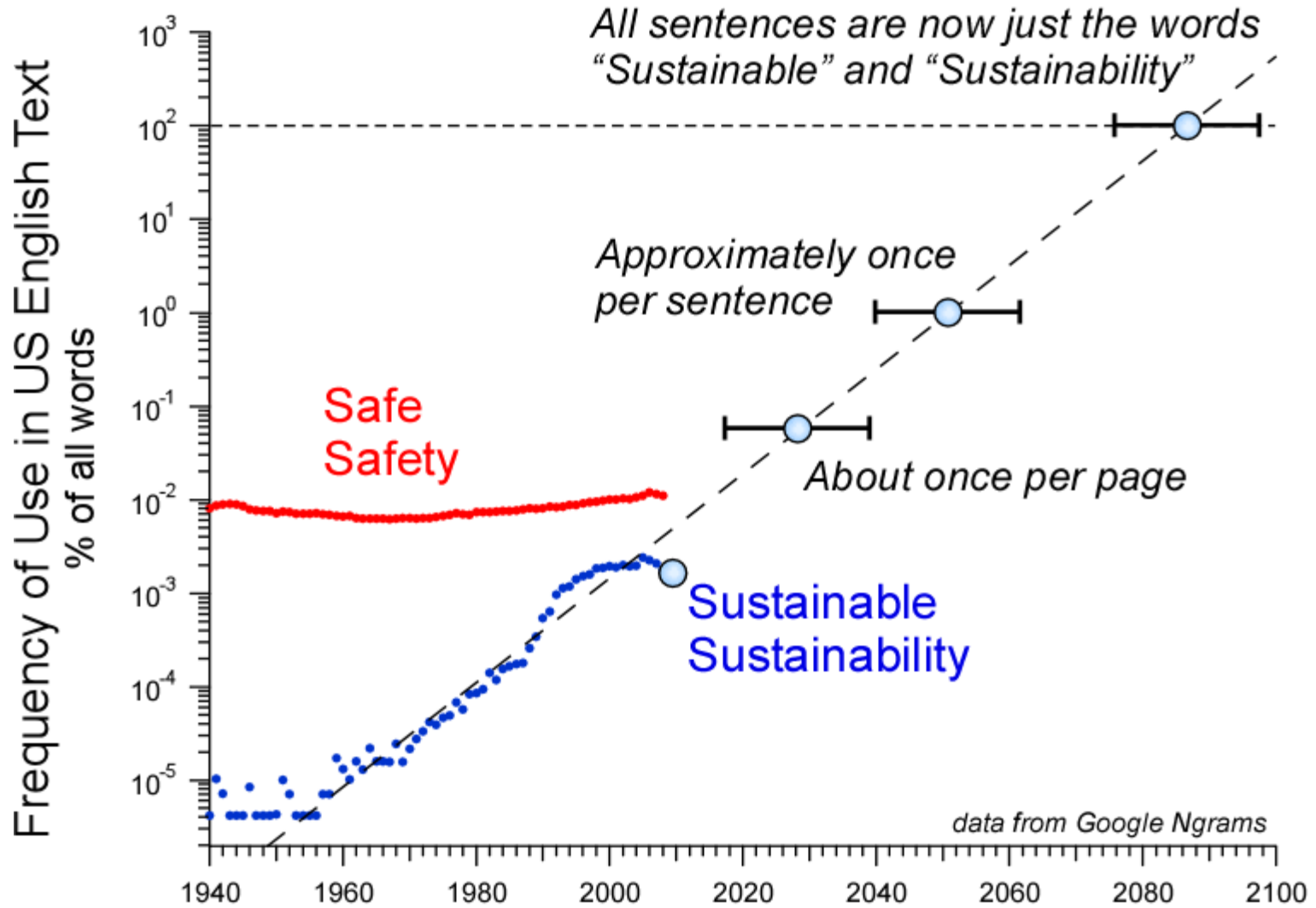
Chicken and Broken Glass



Prevalence of “safe” and “safety”



Overuse of Sustainability?



<https://imgs.xkcd.com/comics/sustainability.png>

Metaphor for Sustainability



Ordered



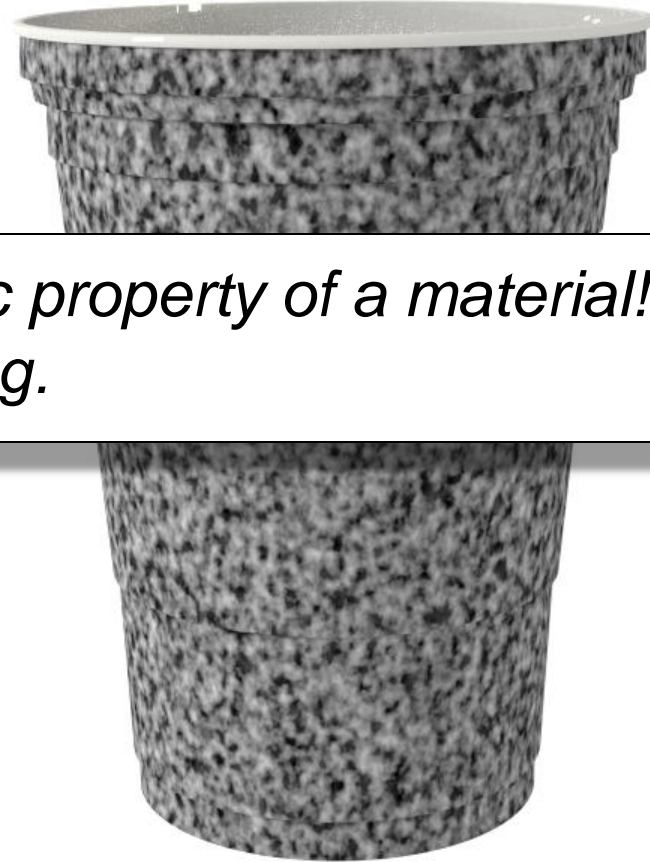
Disordered



Sustainable?



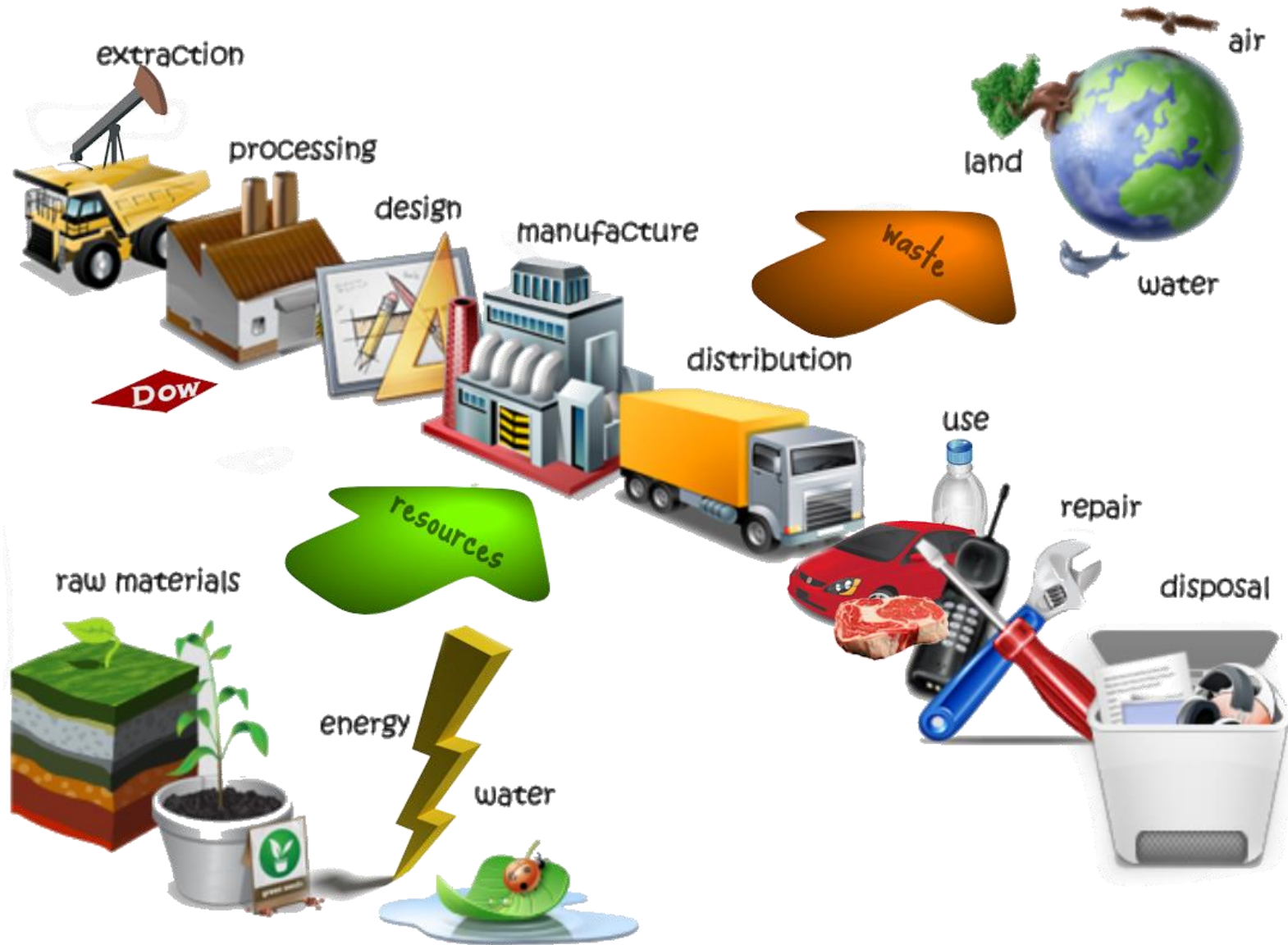
Is this Cup Sustainable?



*Sustainable is not an intrinsic property of a material!
You can't know by just looking.*

How about this one?

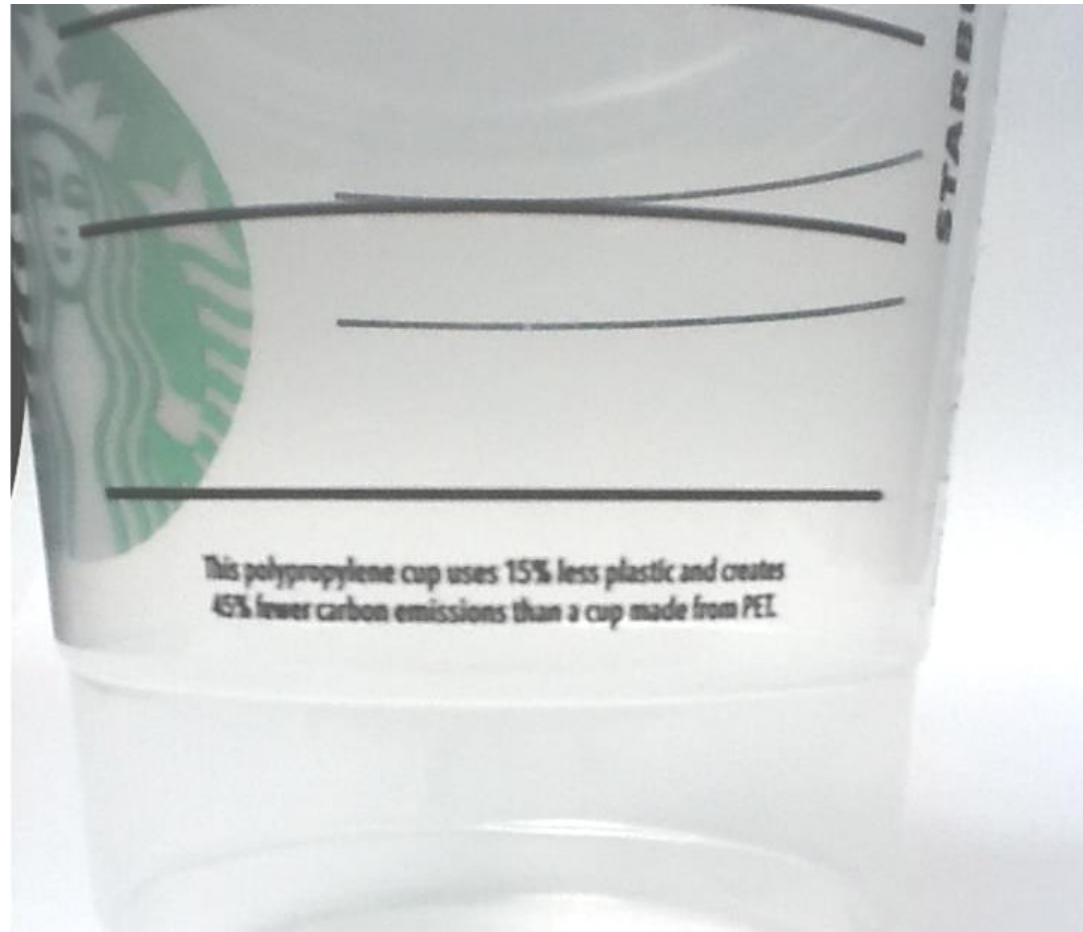
Life Cycle Assessment



adapted from sustainable-graphic-design.blogspot.com



Signs of Hope



Which is more sustainable?

plastic



paper

Which is more sustainable?

A meat-eater in a Prius

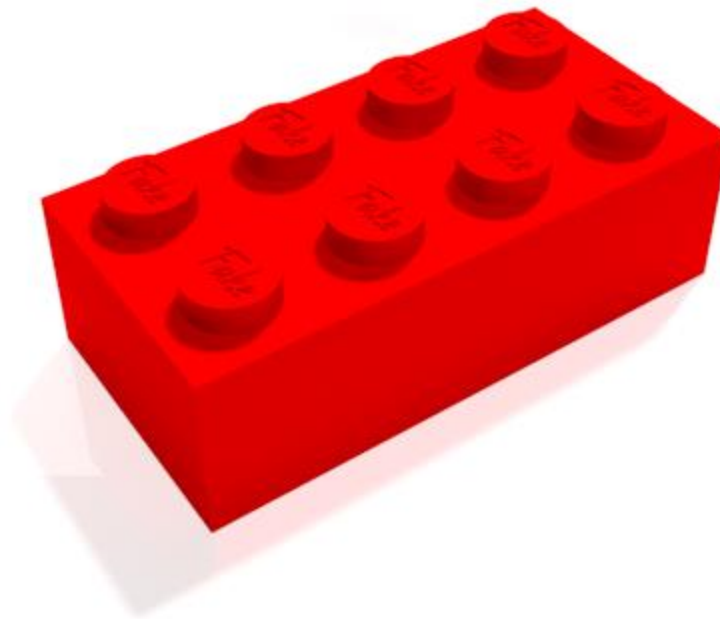


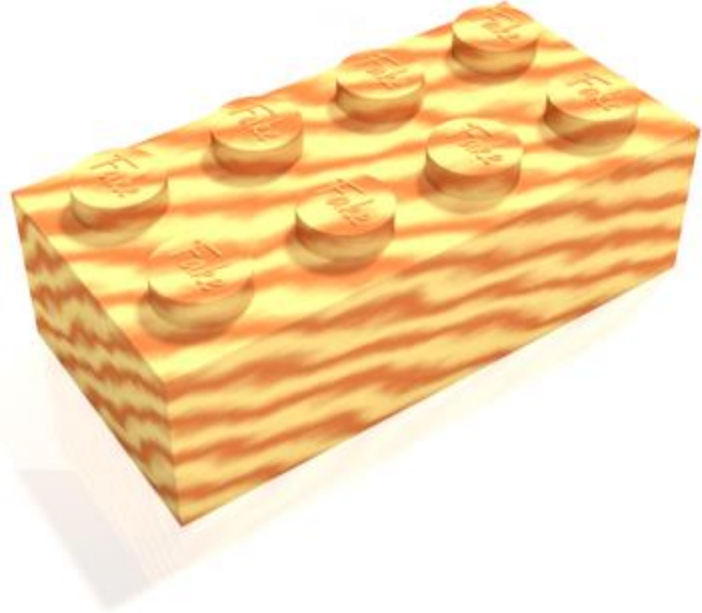
A vegan in a Hummer

Case Study

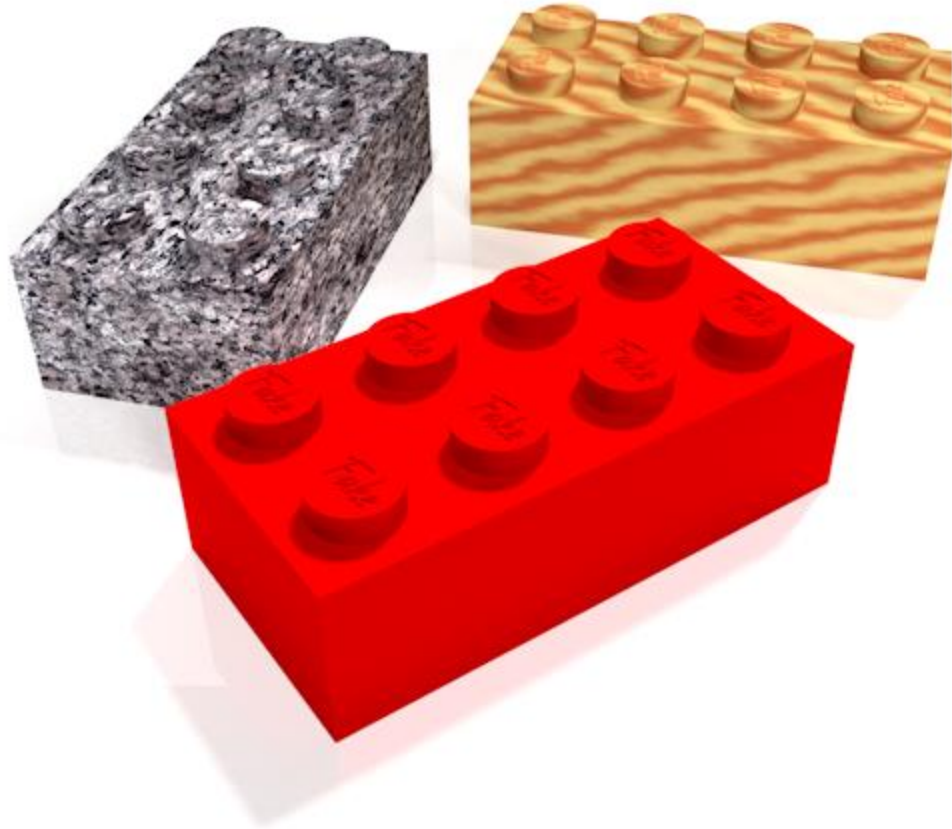


■ Lego Searches for ABS Replacement











Waste Reduction Hierarchy



Circular Economy

Circular
Economy

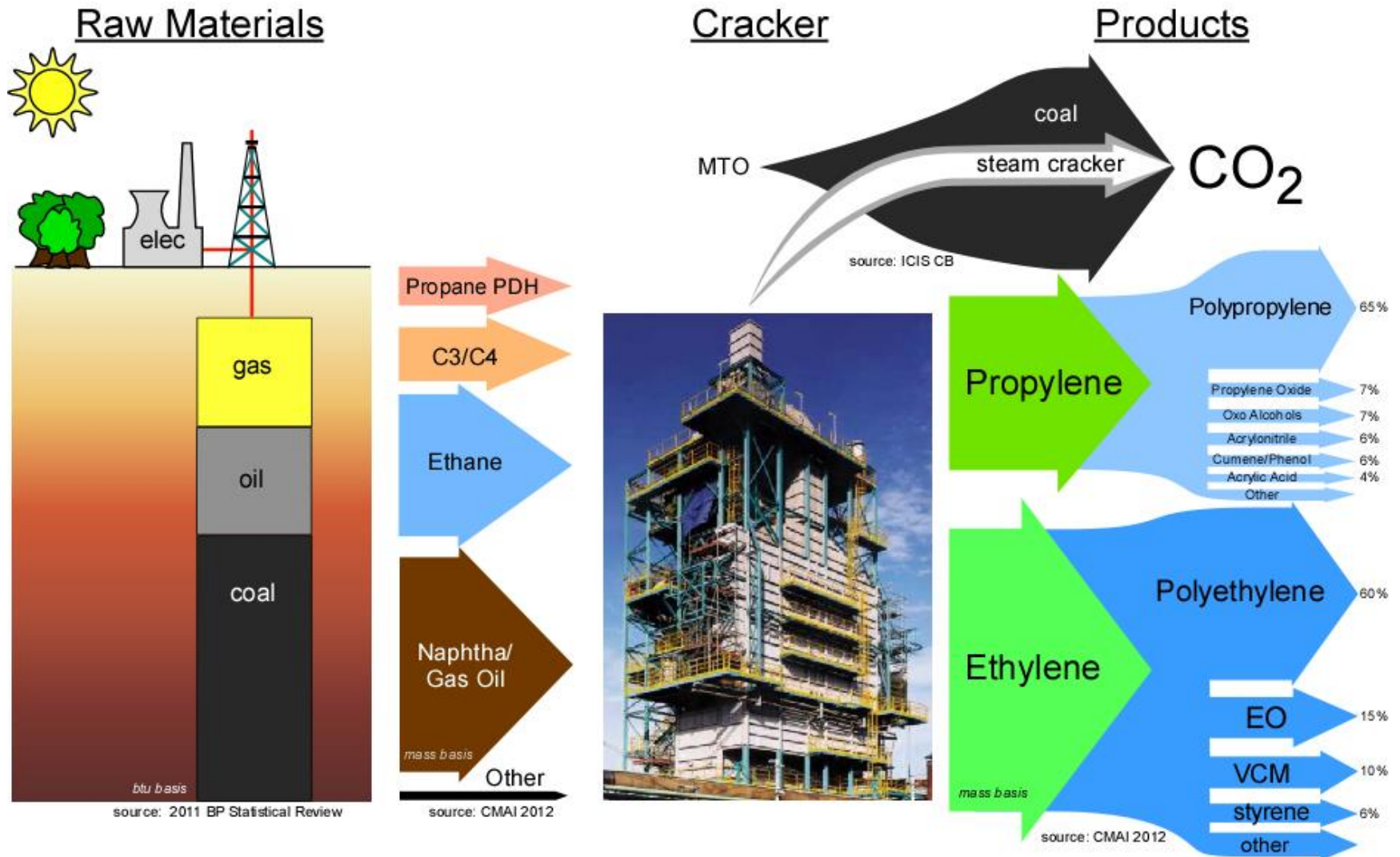




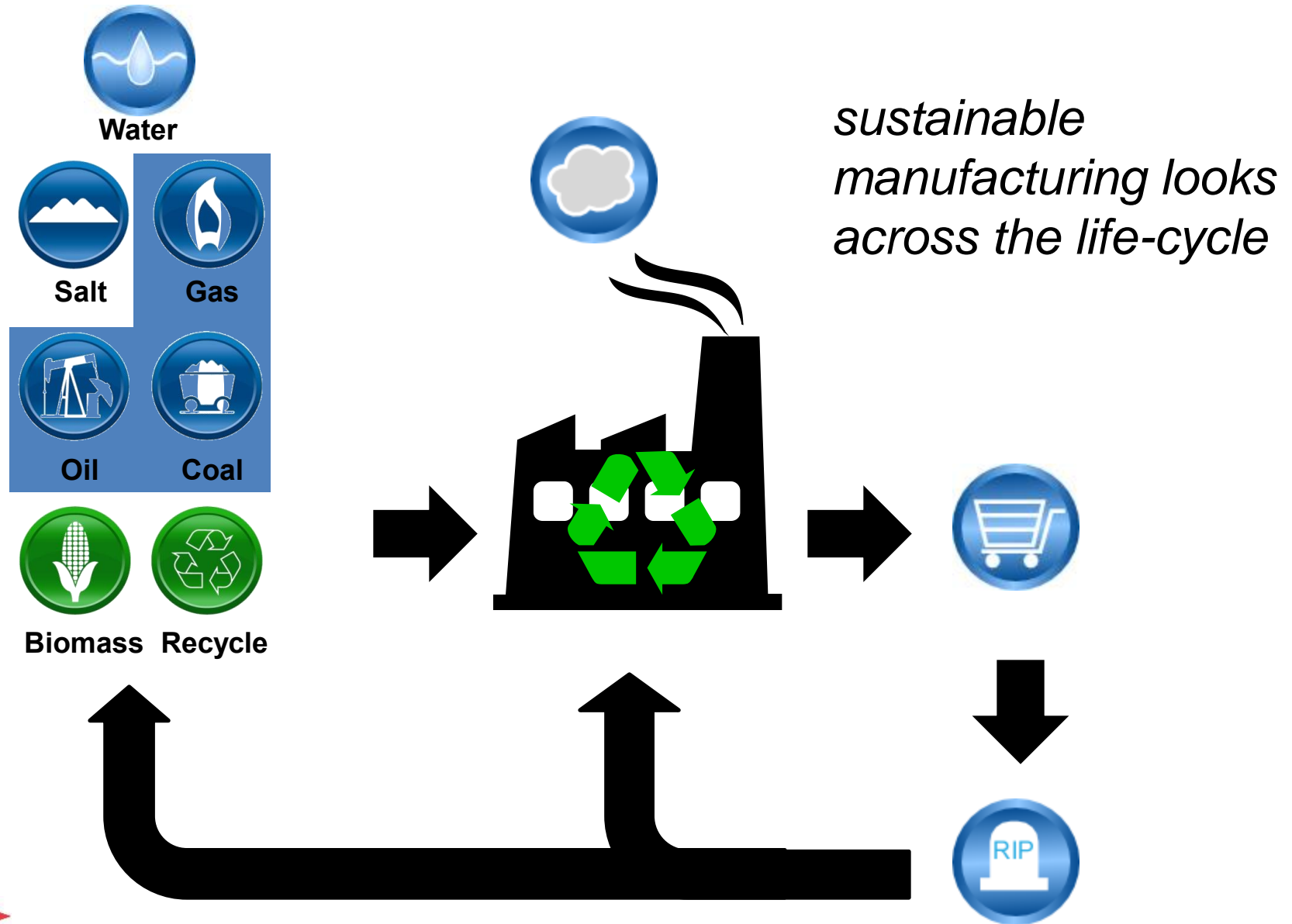
DOW

®

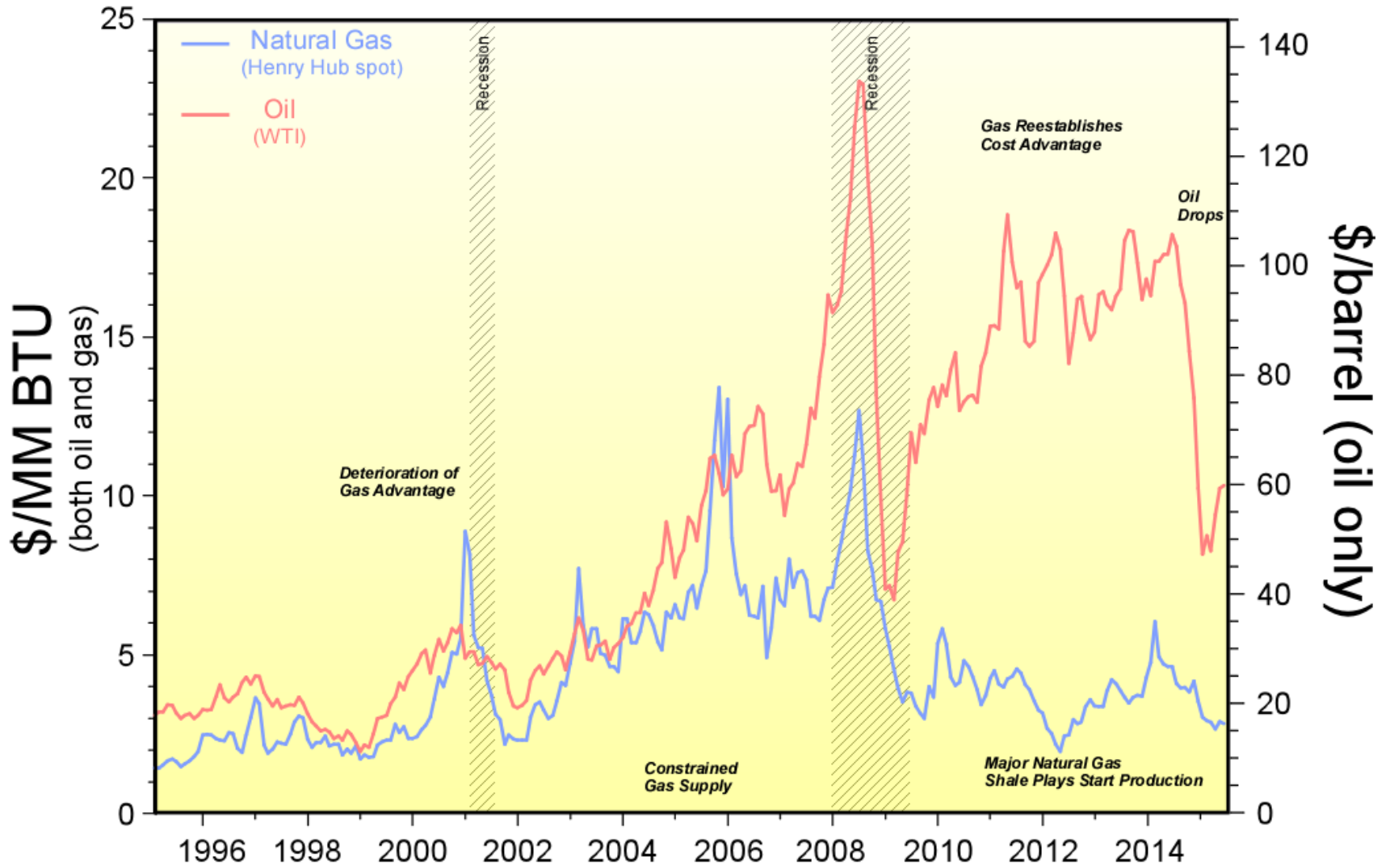
Chemical Industry Snapshot



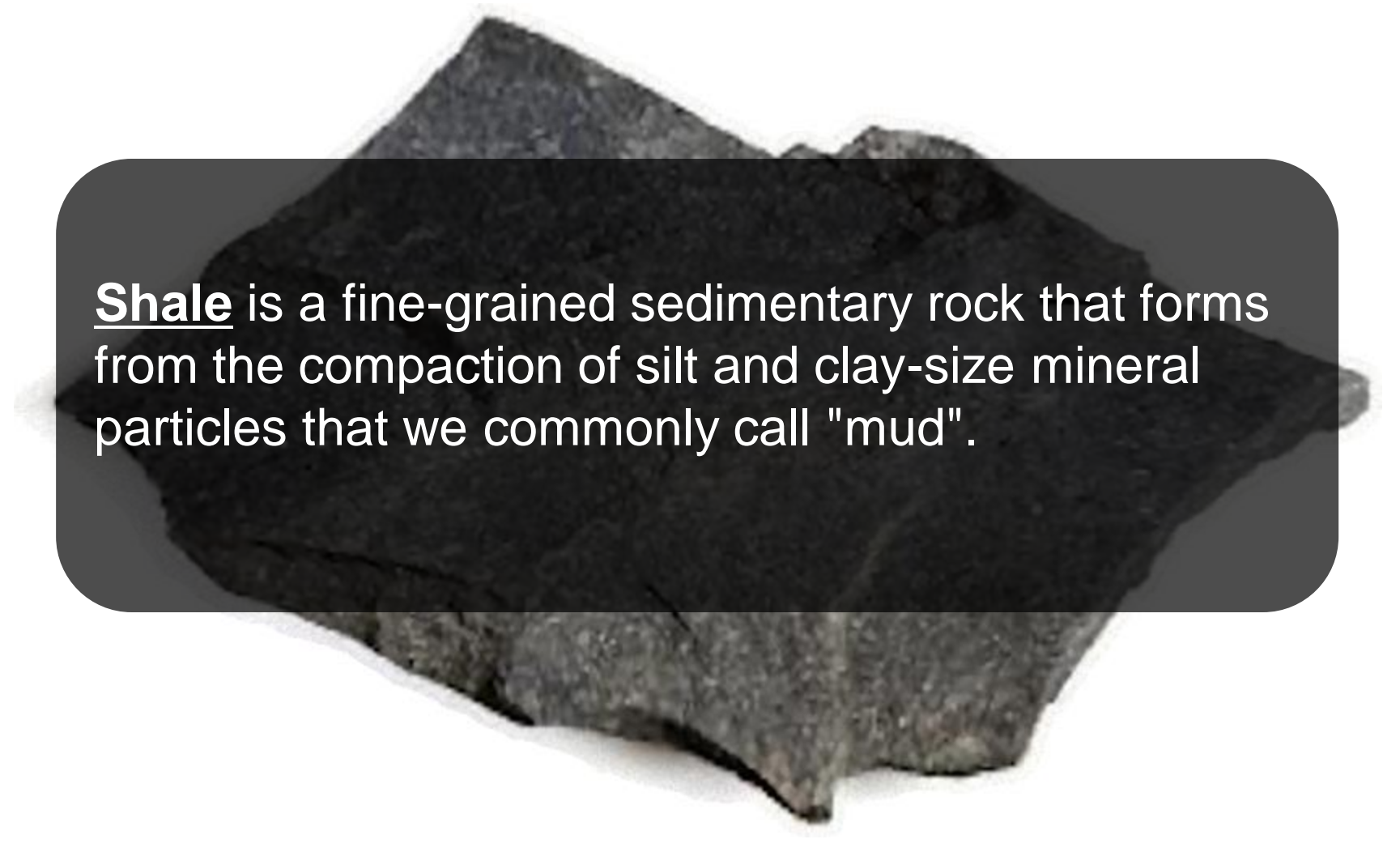
Sustainable Manufacturing Requires Broader Look



Energy Cost

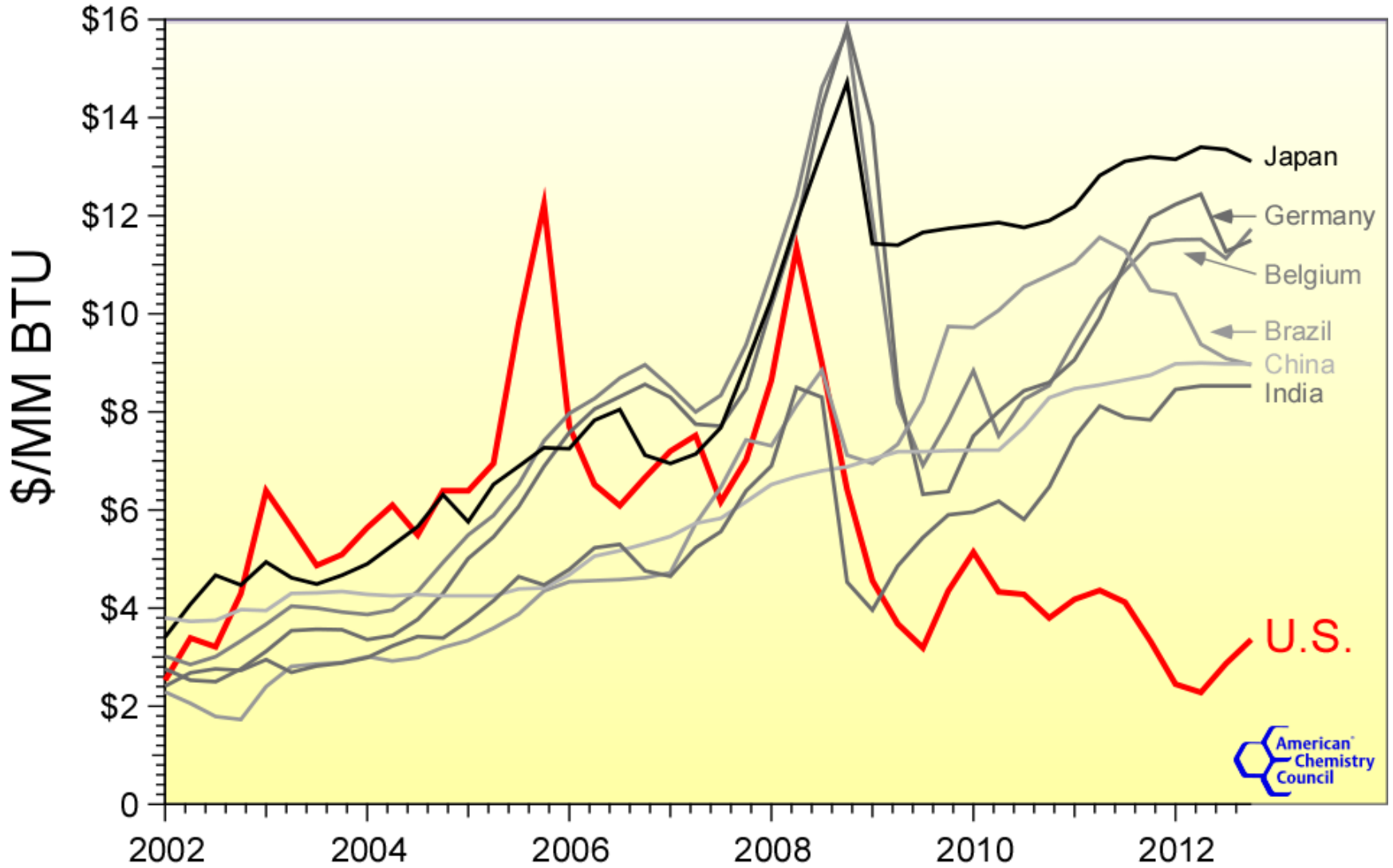




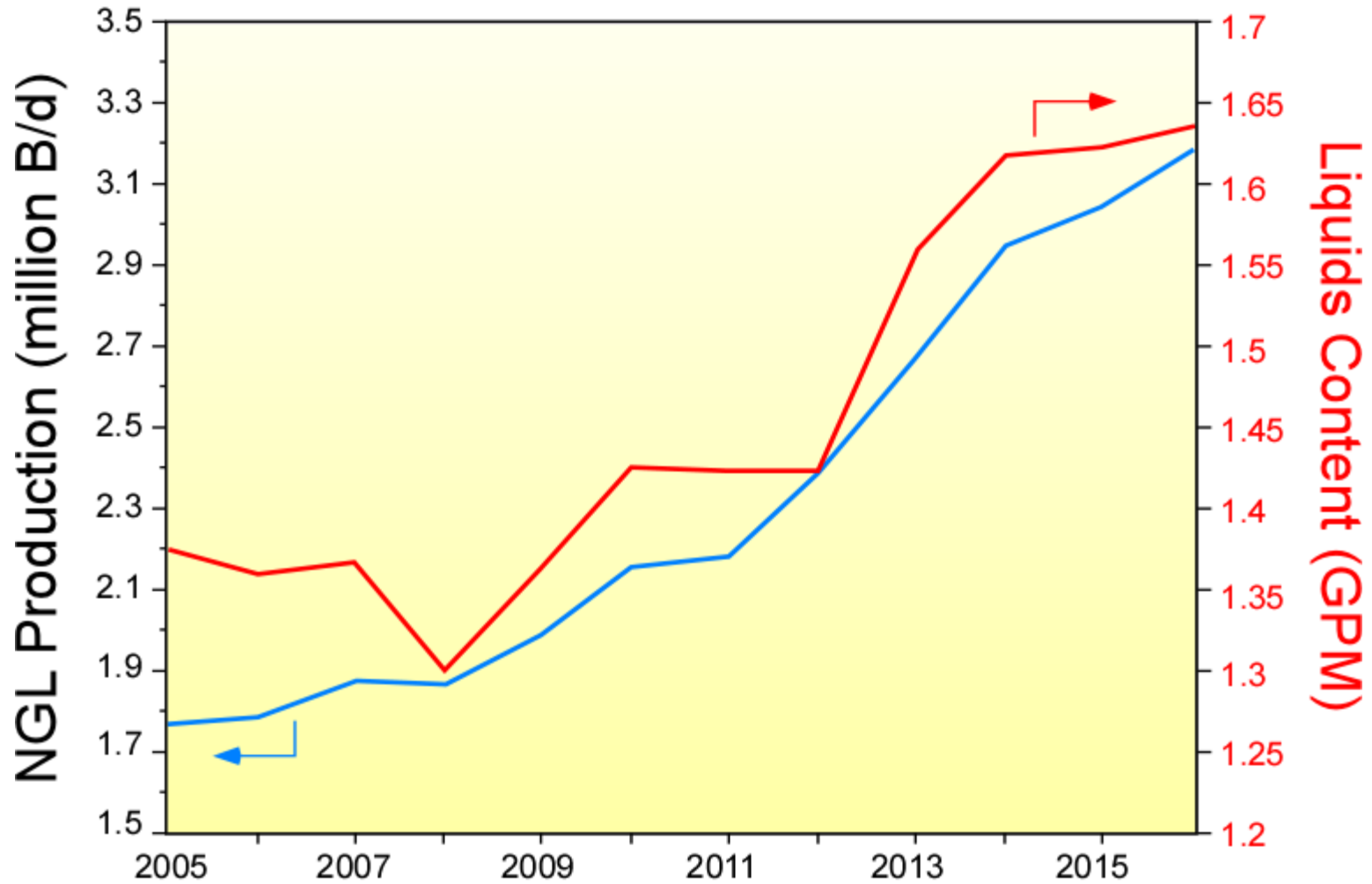


Shale is a fine-grained sedimentary rock that forms from the compaction of silt and clay-size mineral particles that we commonly call "mud".

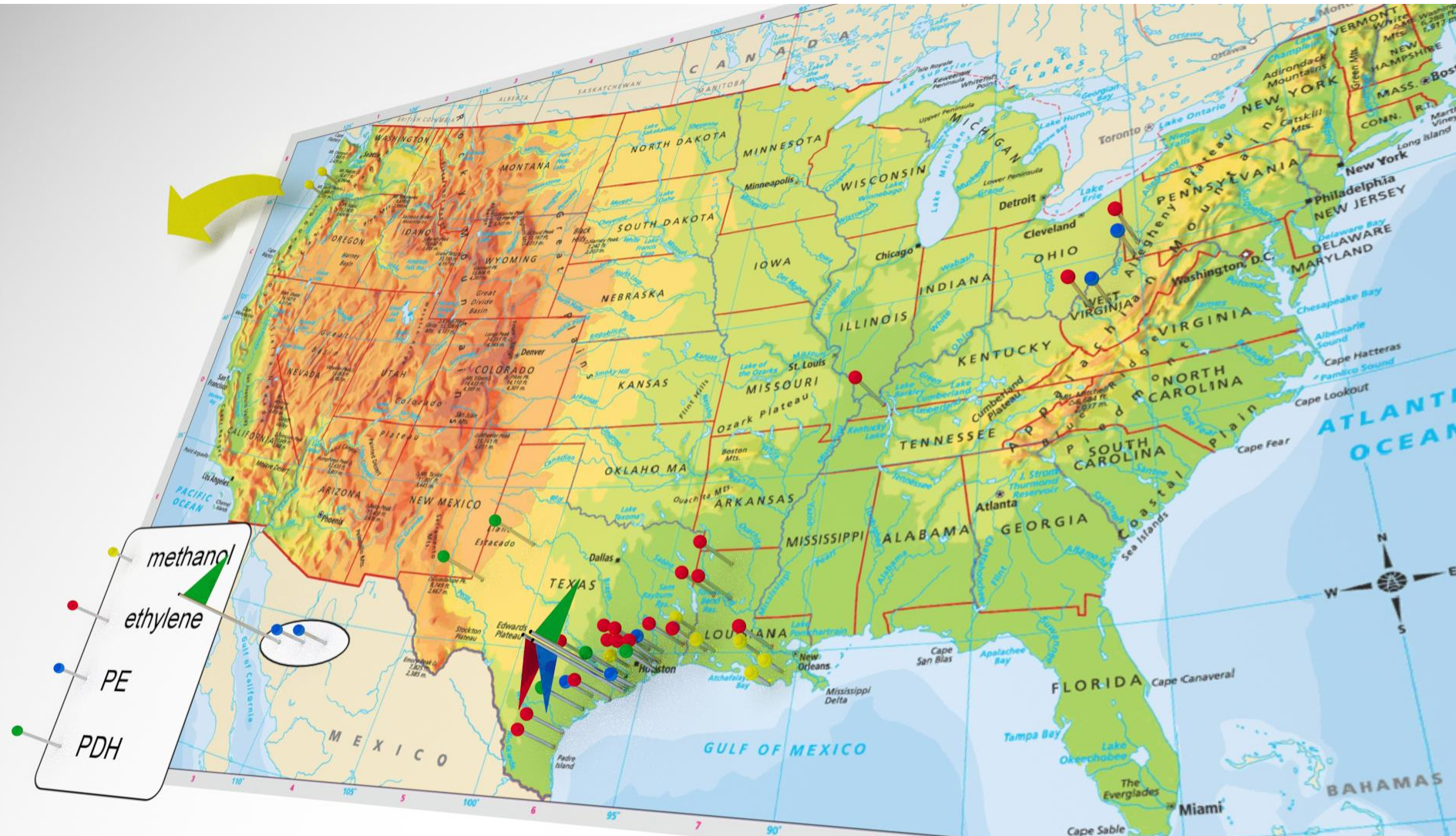
Global Gas Price



More Liquids



Announced Projects



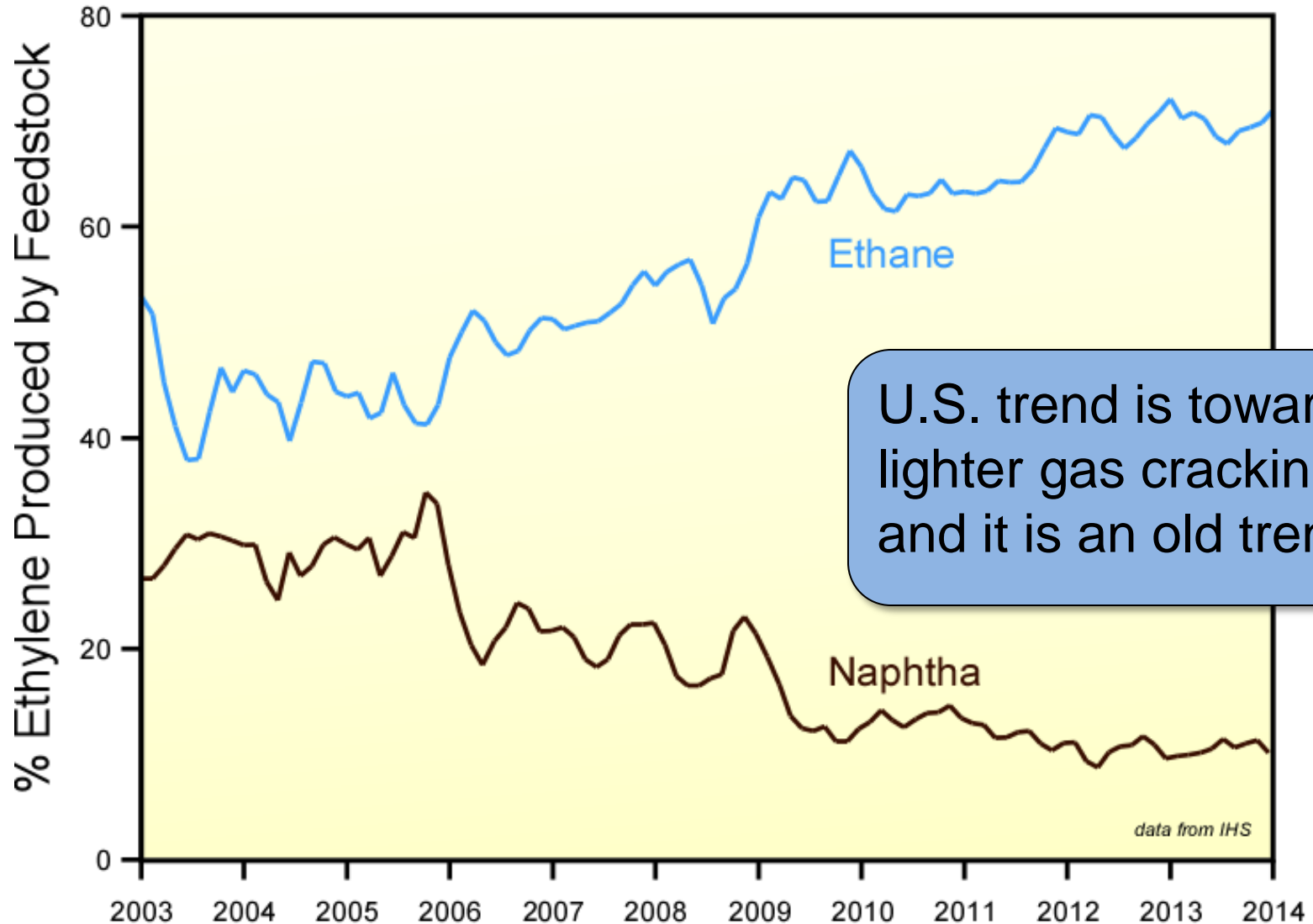
NGLs Still Advantaged In The U.S.



Live Long and Prosper

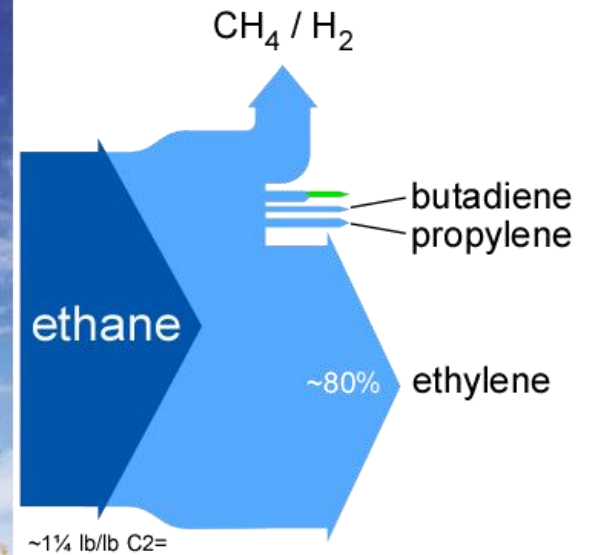
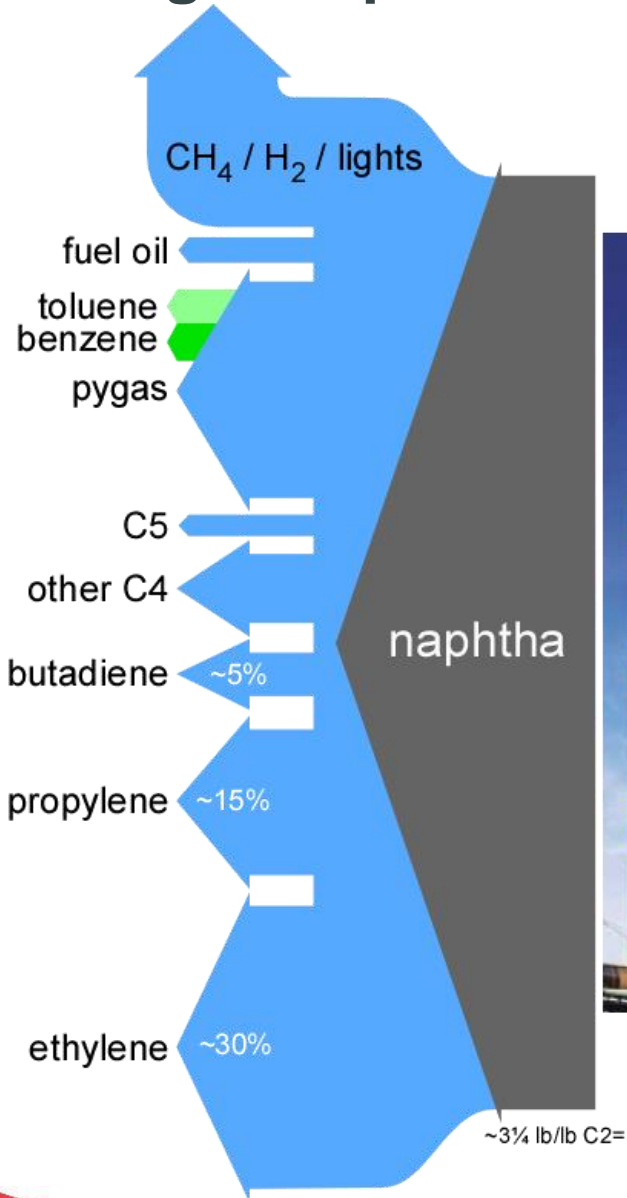


US Trend



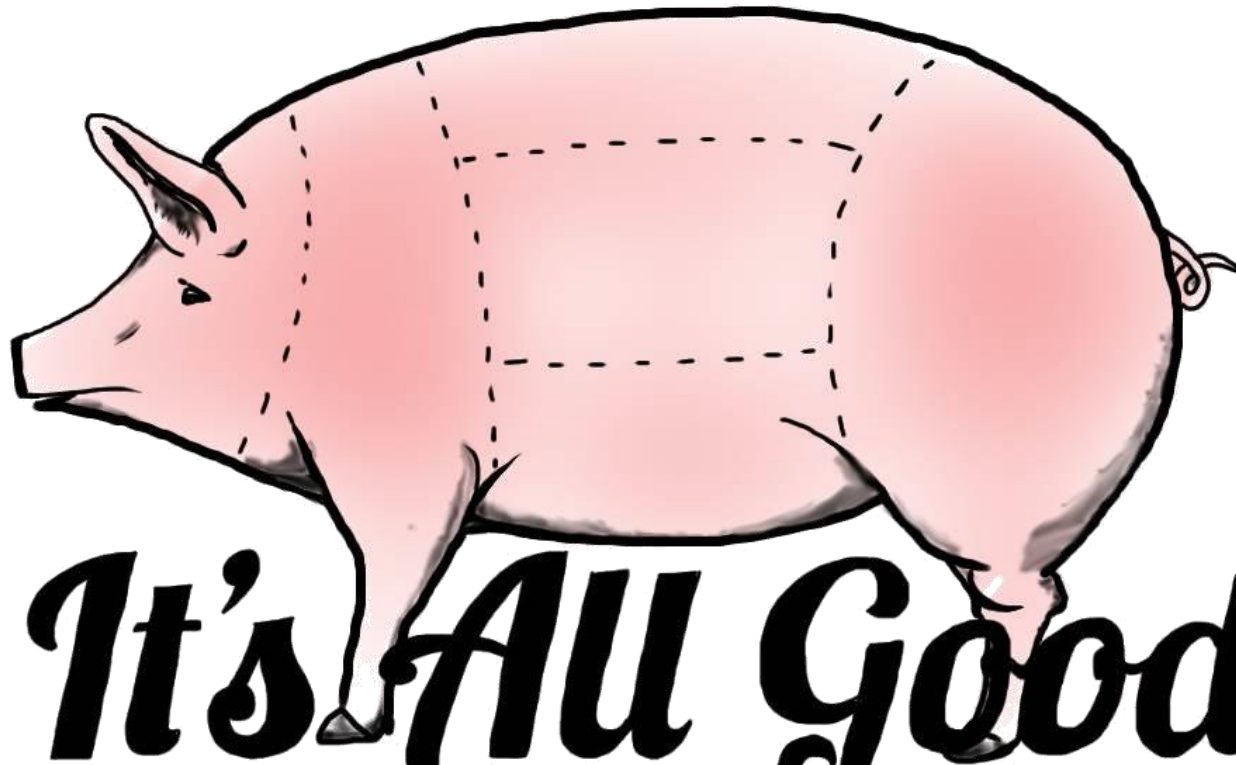
U.S. trend is toward lighter gas cracking and it is an old trend

Cracking Comparison



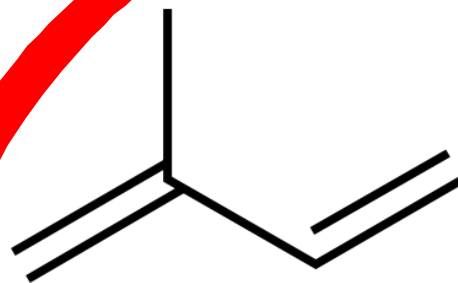
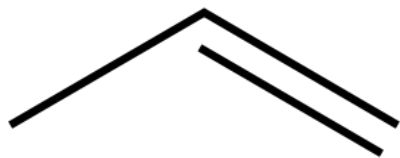
same amount of ethylene

■ All Reaction Products Find Uses

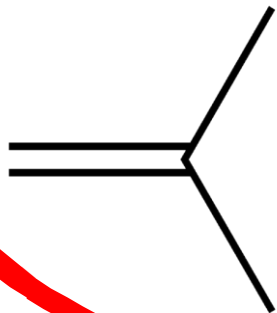
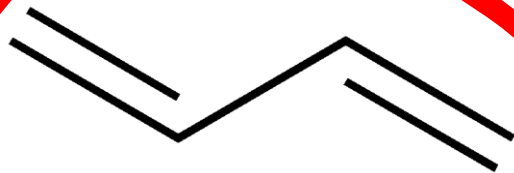


It's All Good!

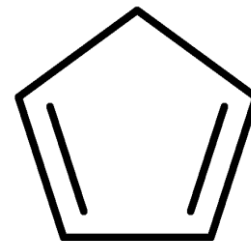
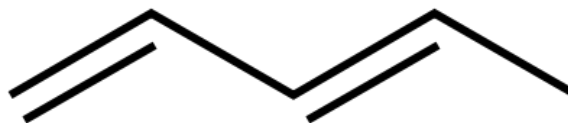
What's Gone Away?



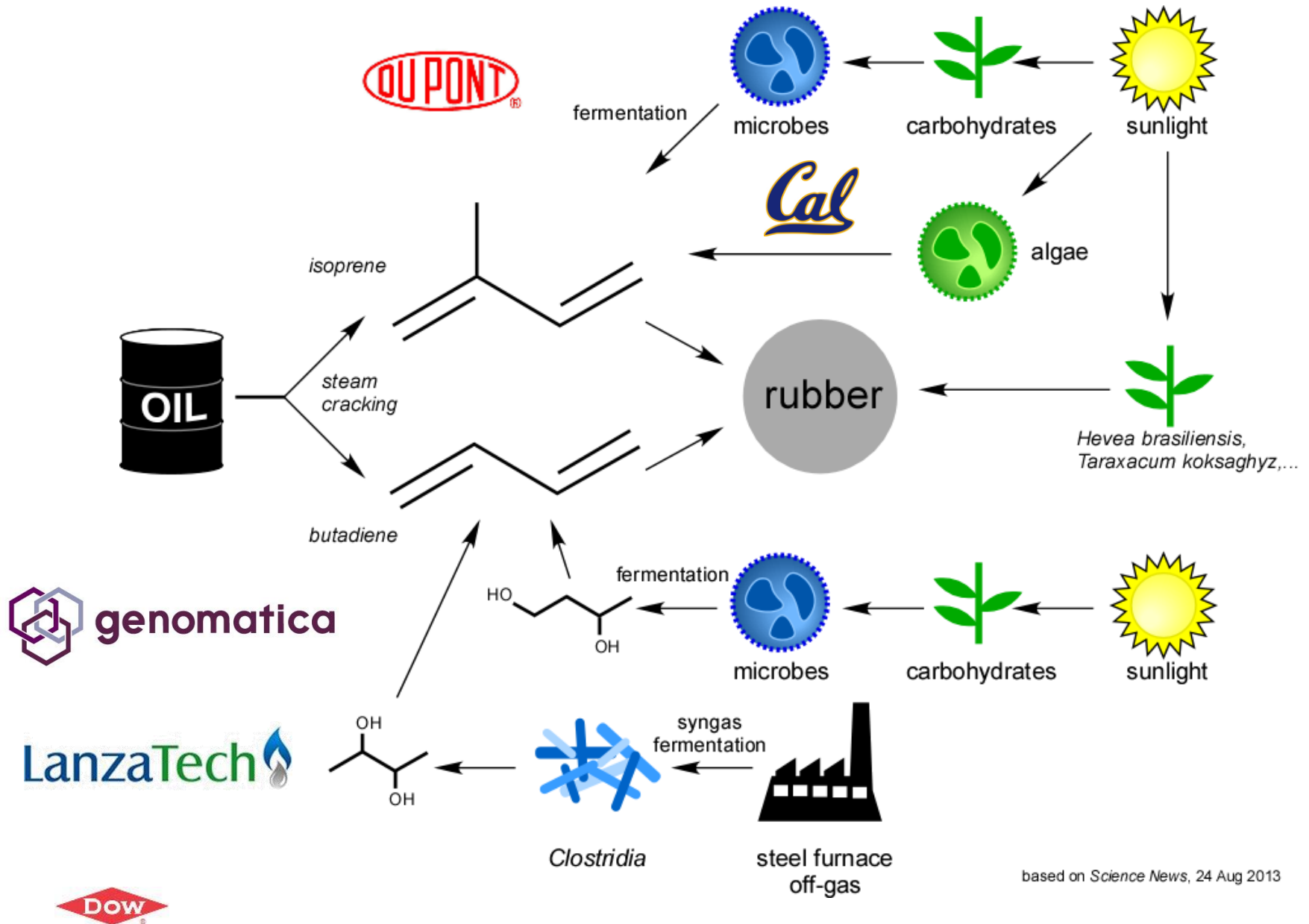
C5



C4

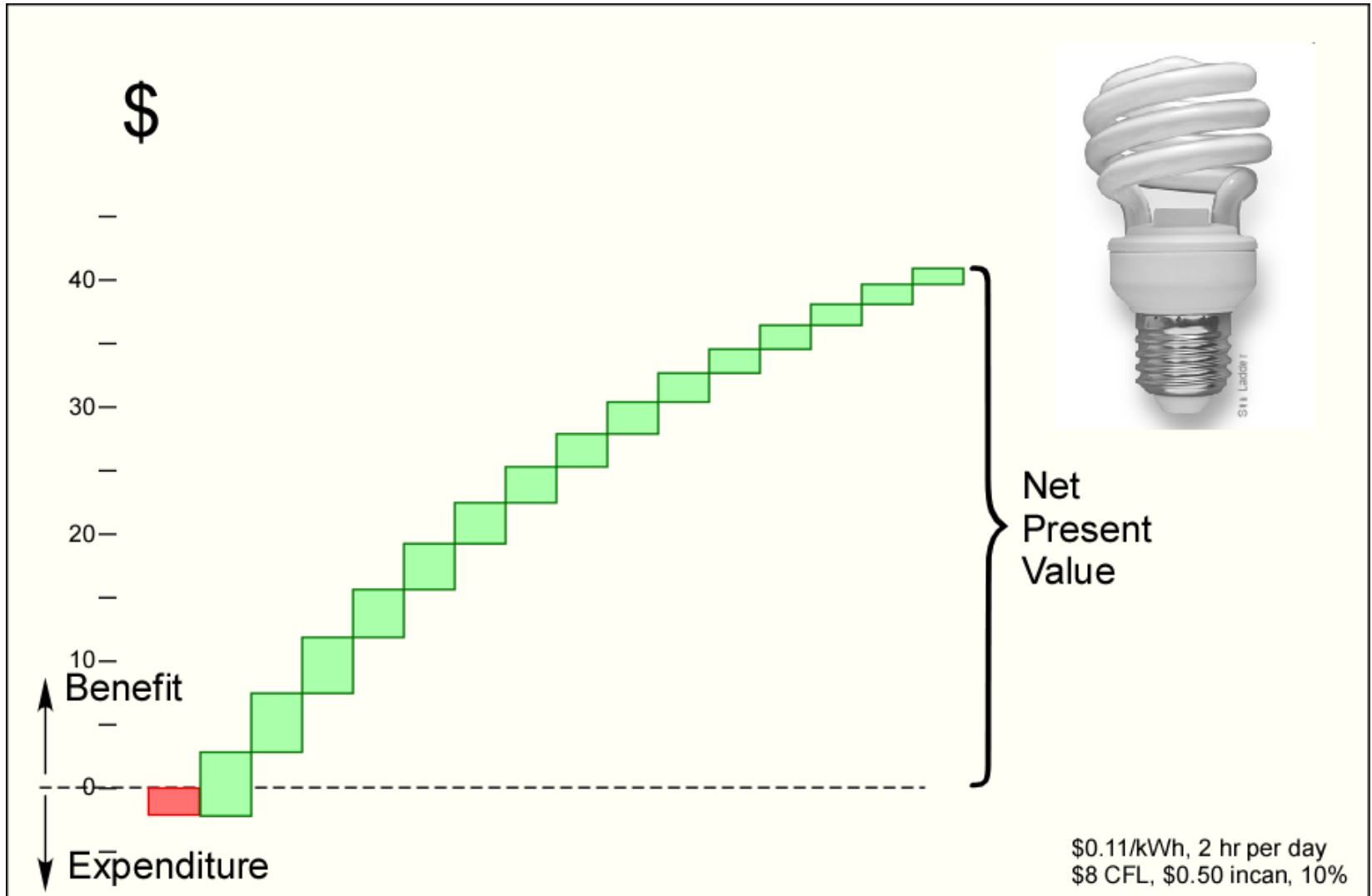


Rubber Monomers

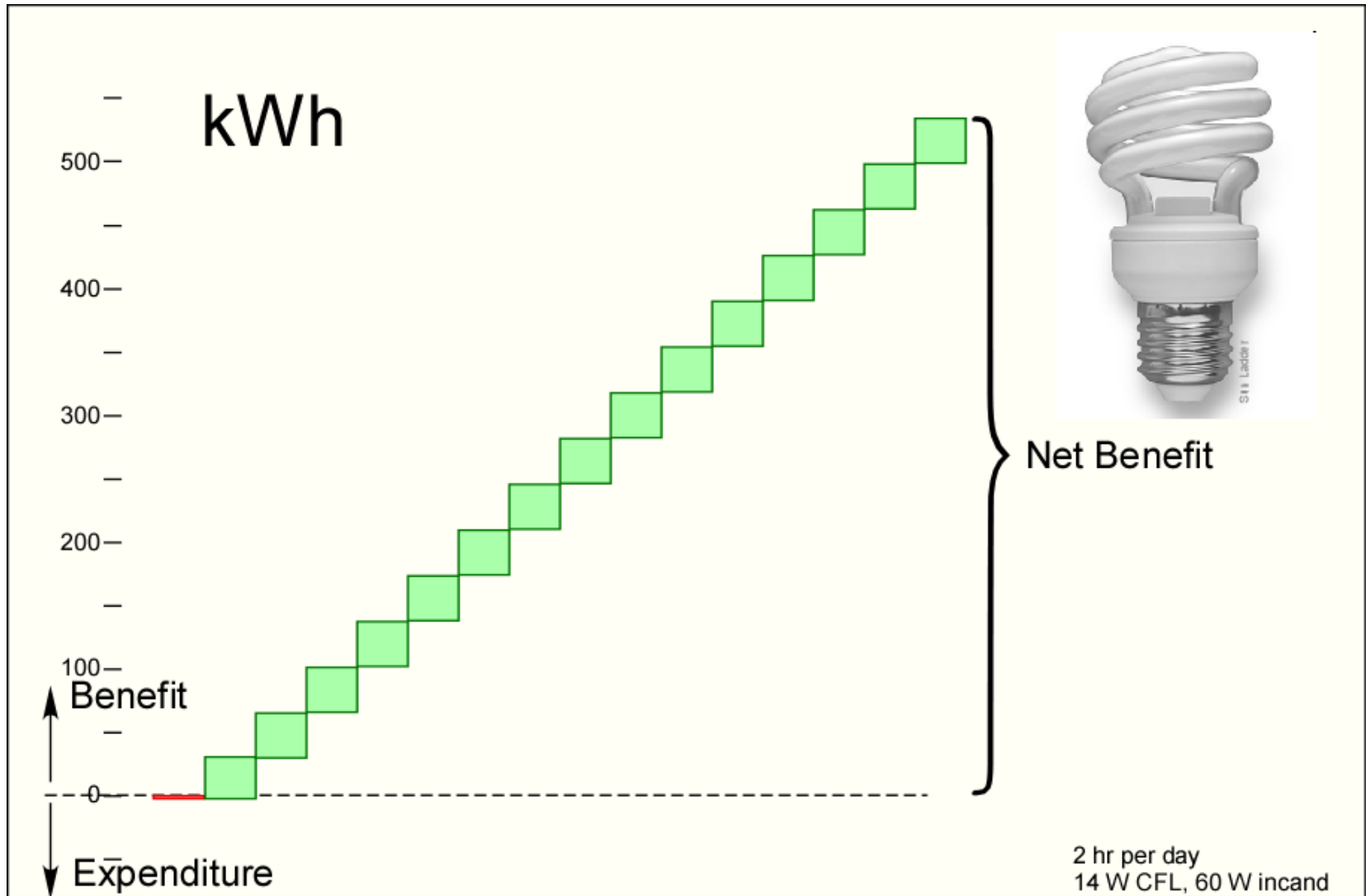




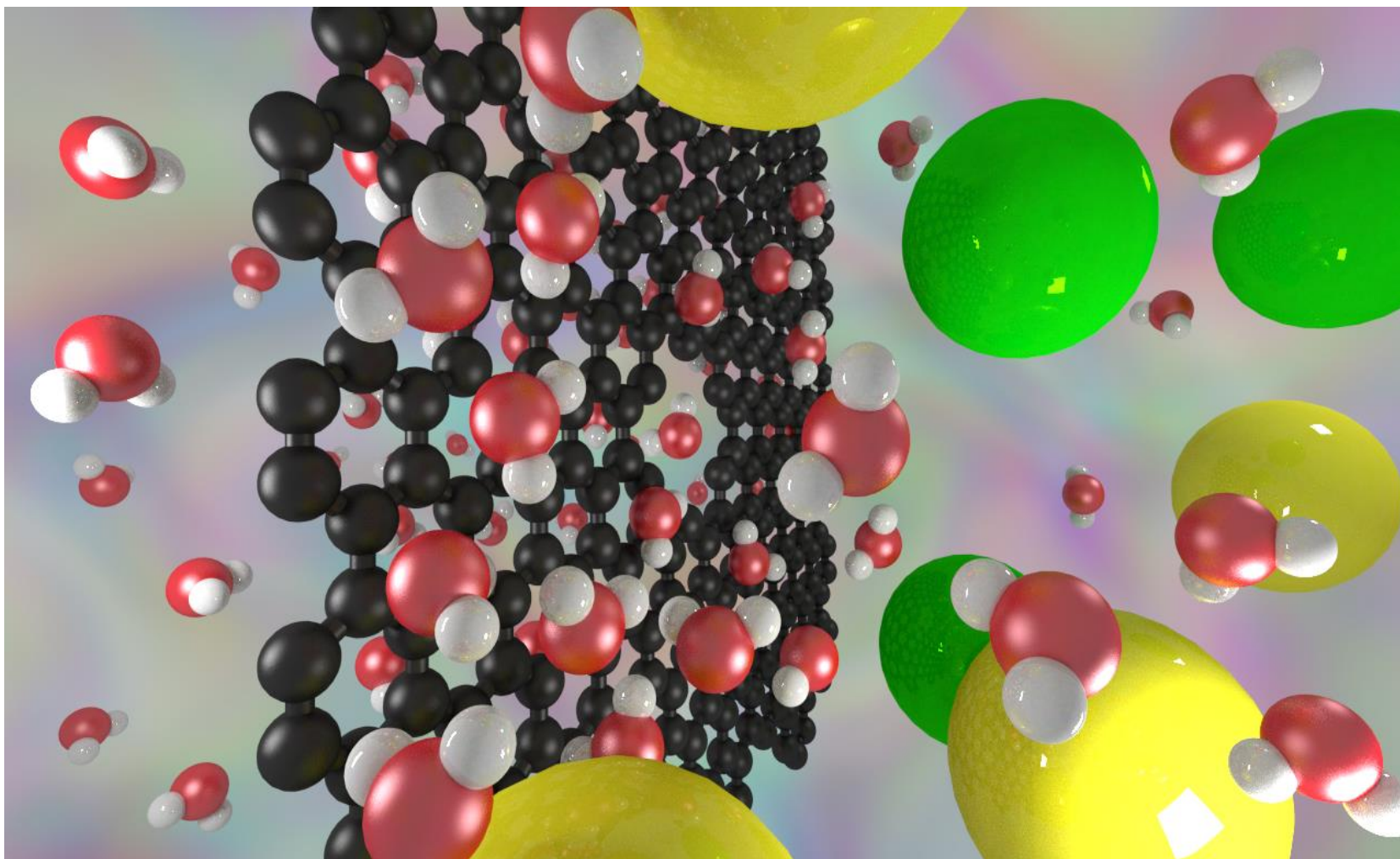
Financial Way of Looking At Benefit



Why Not Sustainability?

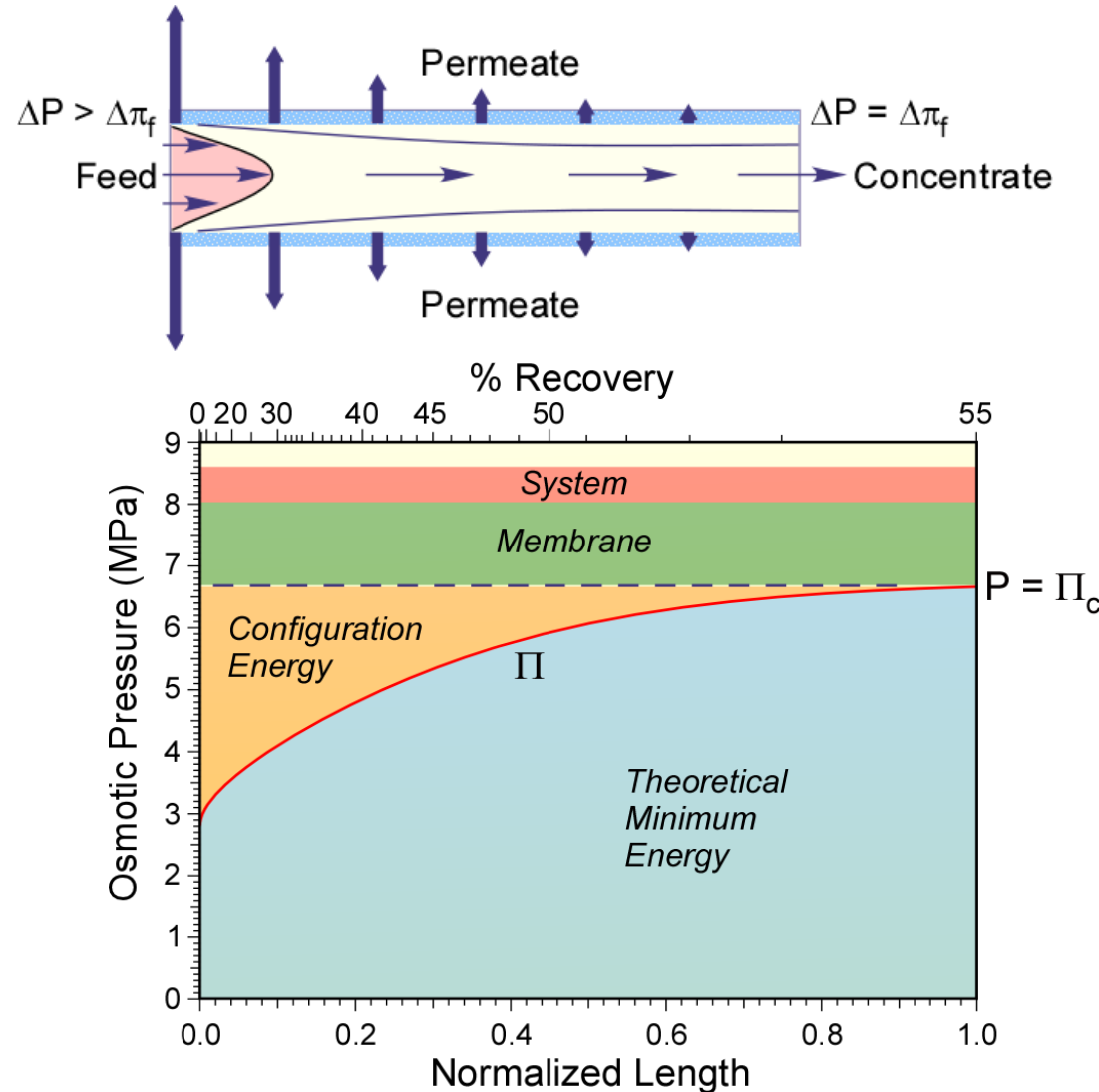
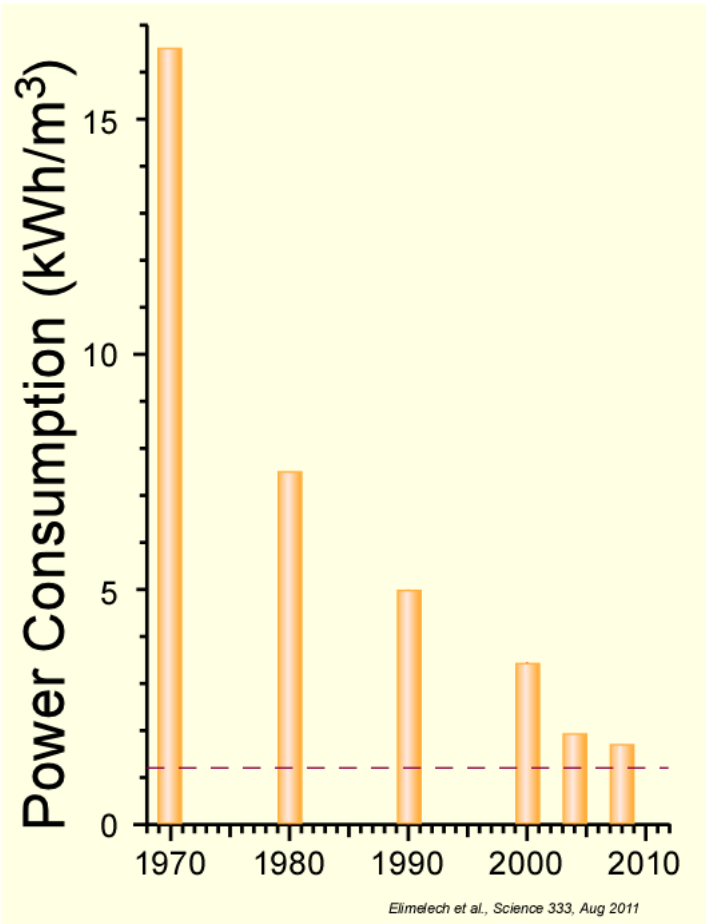


Misconceptions Demean Advances



Fresh Water Production

Simple Distillation $\sim 600 \text{ kWh/m}^3$

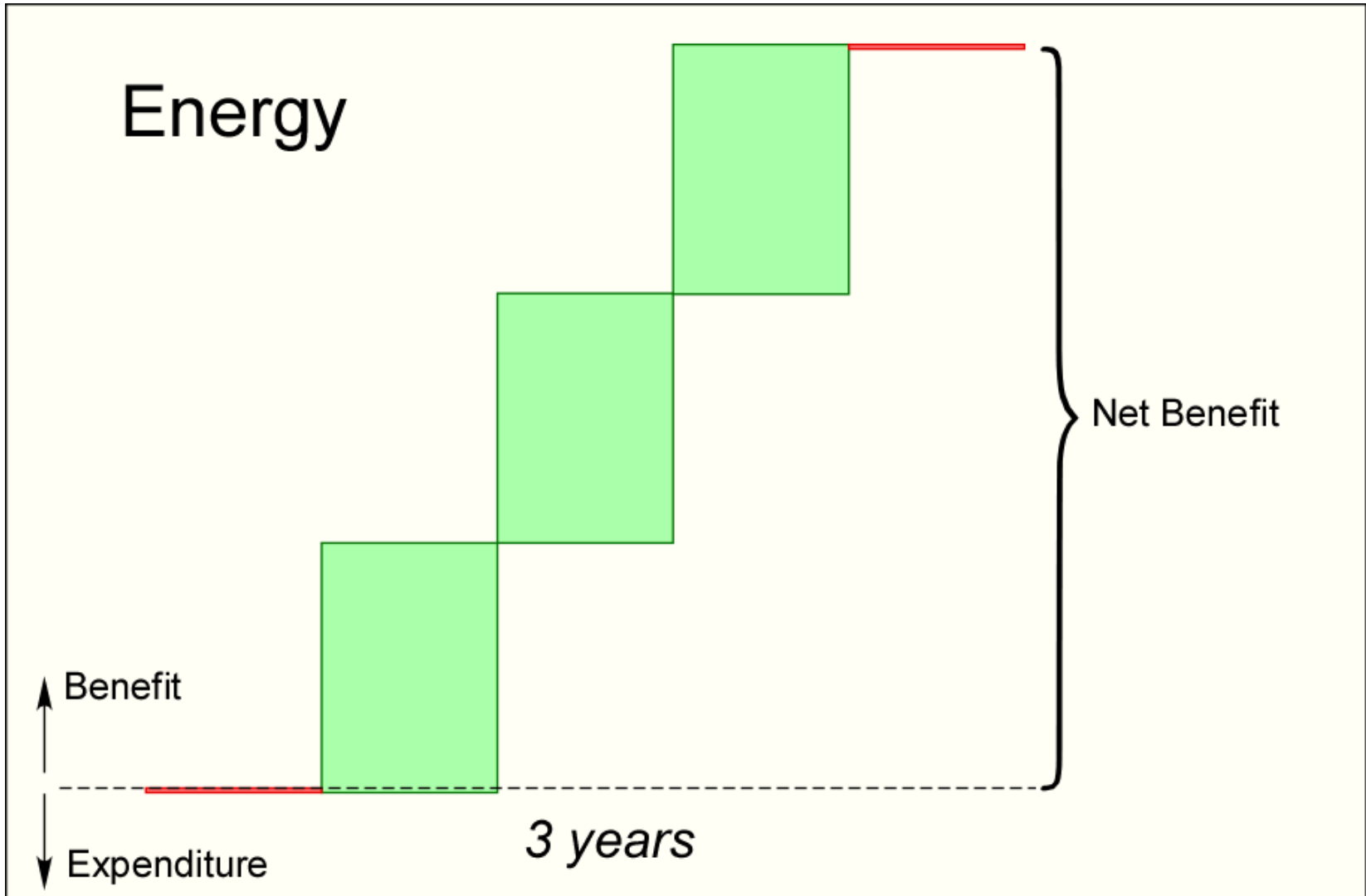


Energy-efficient DOW FILMTEC™ Water Treatment Membranes yield savings on water purification



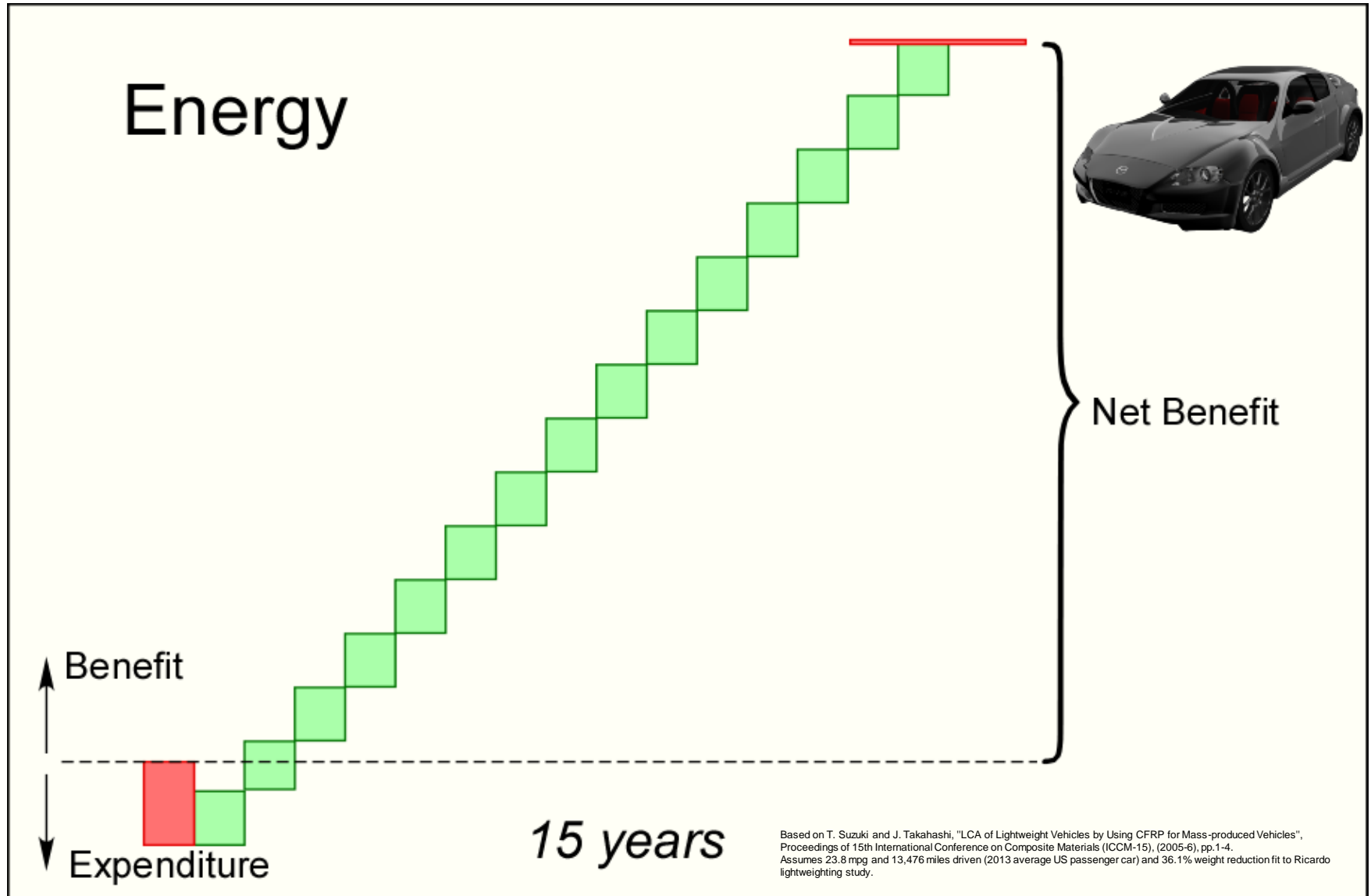
Process	Operating Energy Consumption (Kwh/m ³)	Customer Energy Savings 2005-2015 (Barrels of Oil-eq)
Multi Stage Flash (MSF)	13.5 - 25.5	242 million
Multi Effect Distillation (MED)	6.5 – 11	82 million
Reverse Osmosis	3 - 3.5	

RO Cartridge Benefit

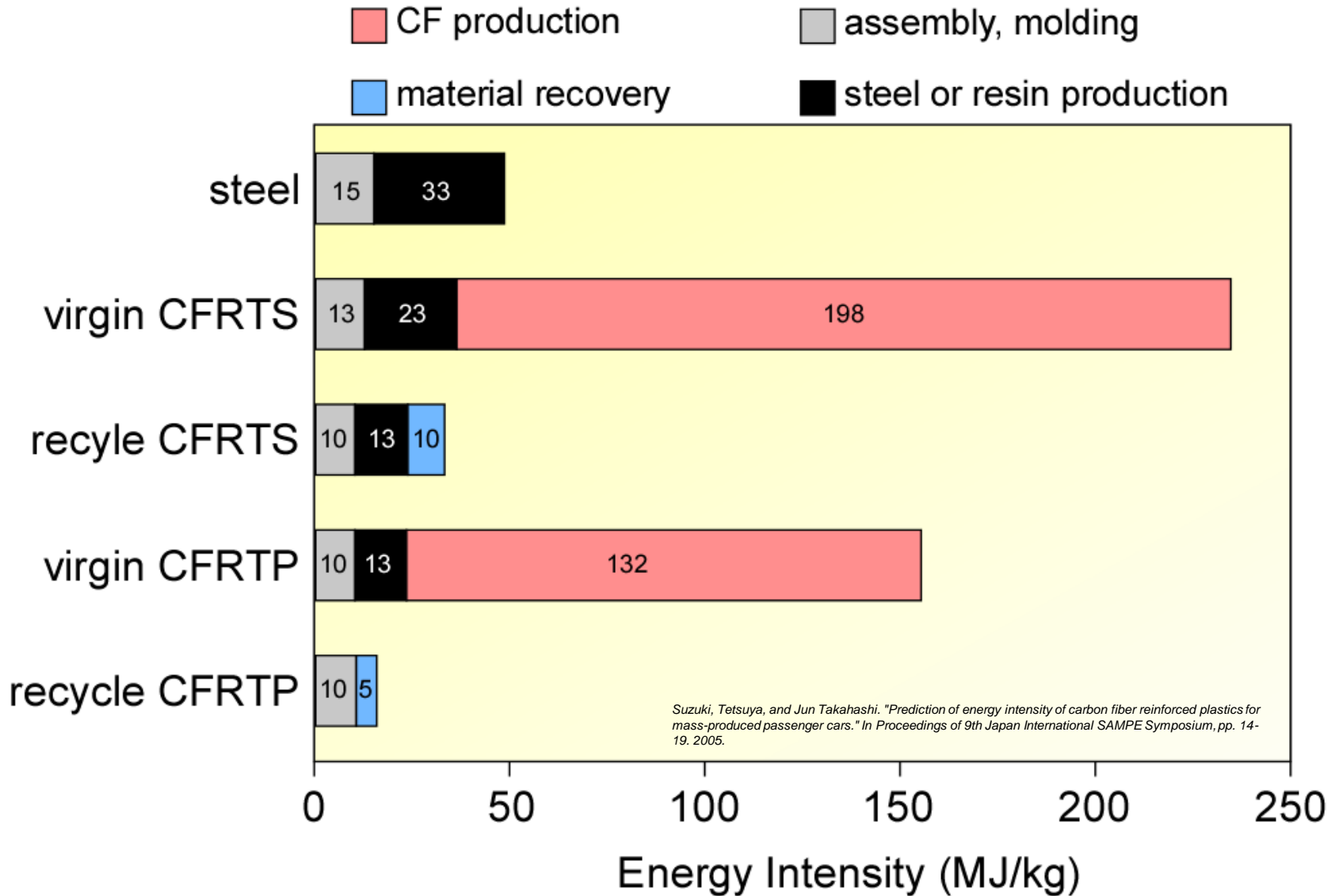


54.5 mpg

Carbon Fiber Benefit



Importance of Recycle

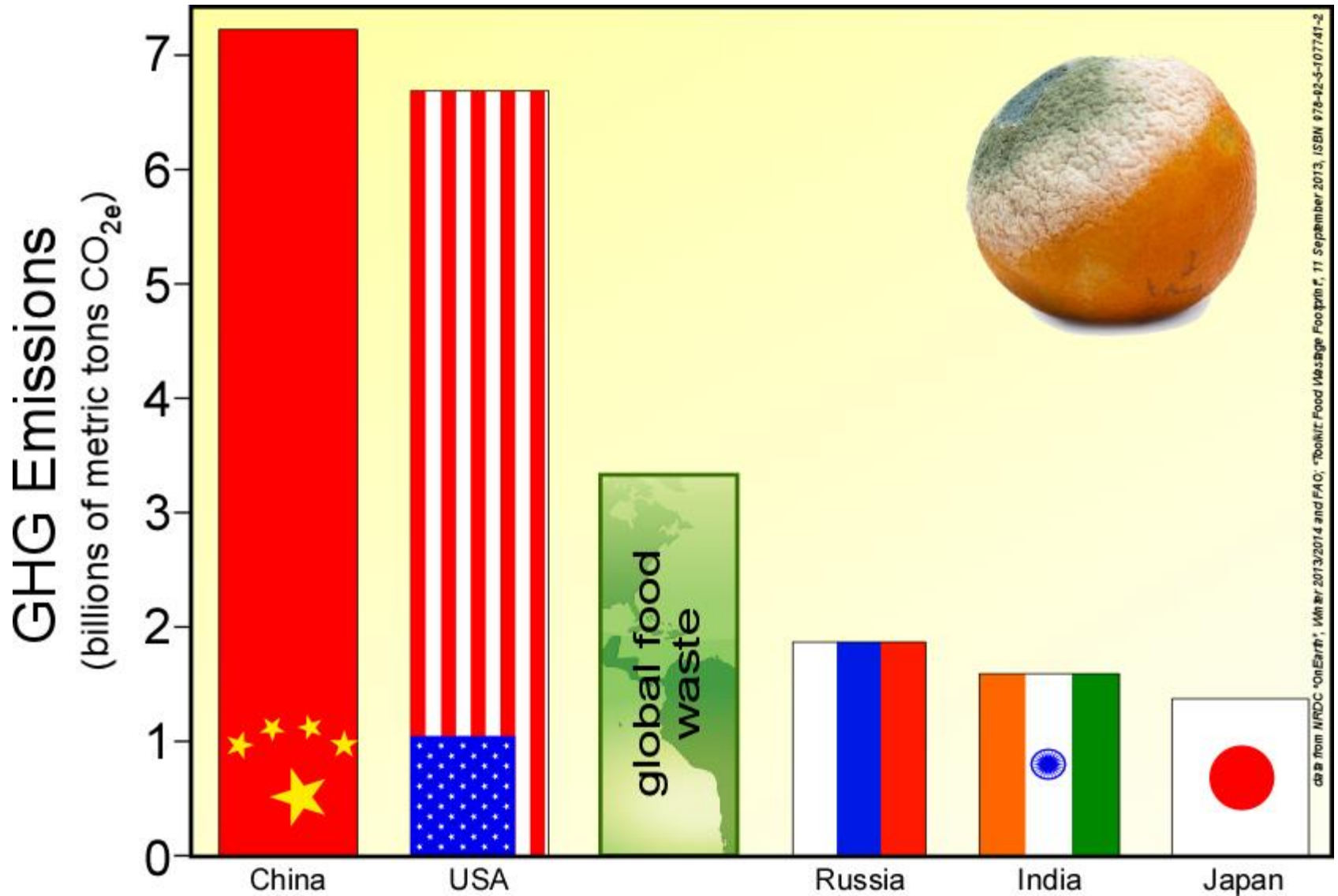


■ Packaging Addresses Global Challenges



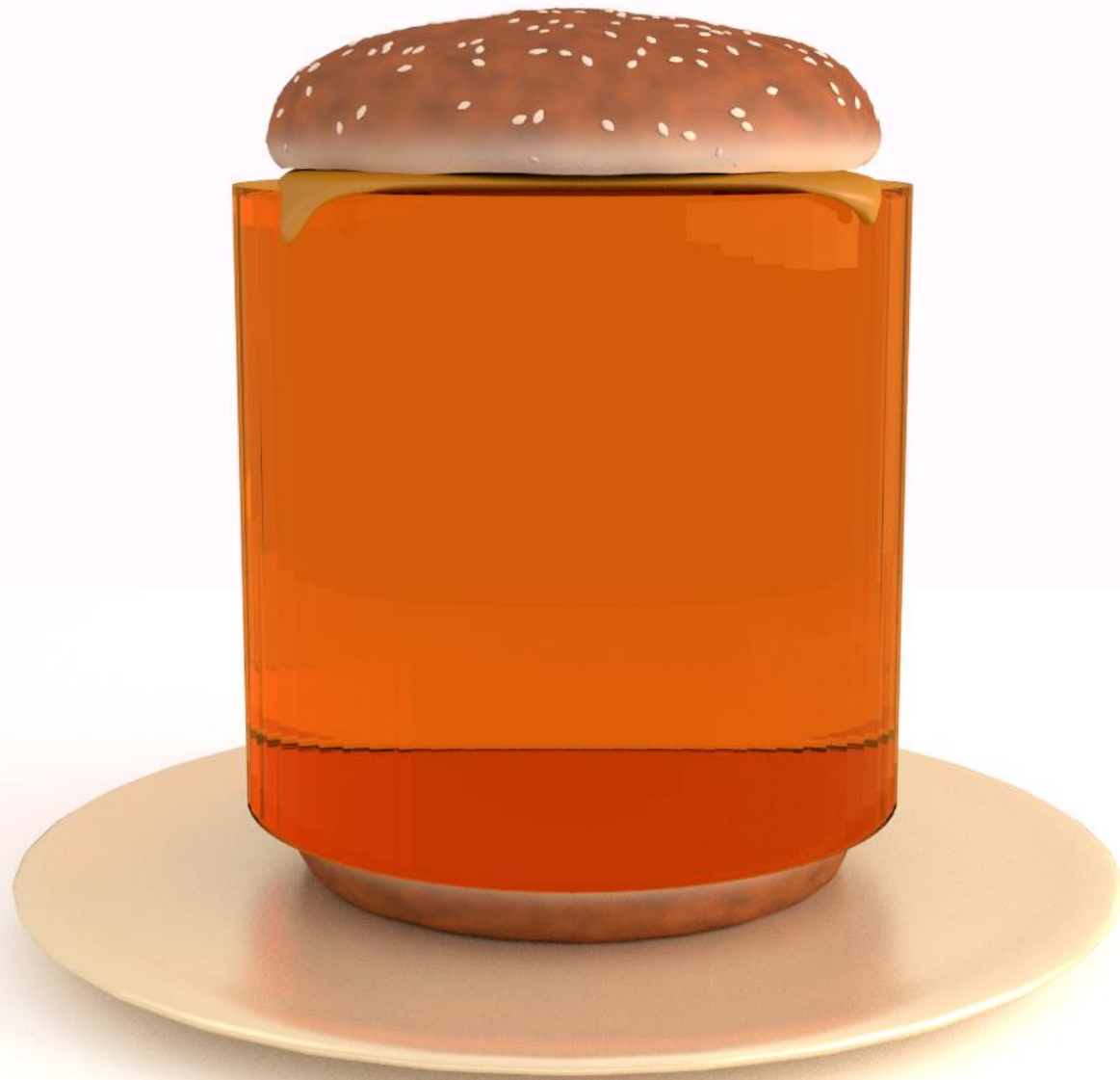
30-40% food grown is wasted. Much of it to spoilage.

Food Waste

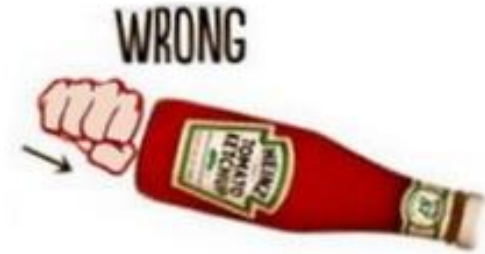


Embodied Fossil Energy





Frustration with Packaging





Flexible Packaging Is More Sustainable Packaging

Re-Closable Cap

- Precision pouring
- Maximum filling content utilization

Flexible Design

- Four Print Surfaces
- Superior drop resistance
- Reduce excess head space
- Improved dispensing
- Collapses easily

Top and Bottom Handles

- Easy handling

Cubic Shape

- Shelf Stable & Maximizes Shipping Efficiency

Space Saving

- Ships and Stores Flat when Unfilled



Flexible packaging helps increase shelf life

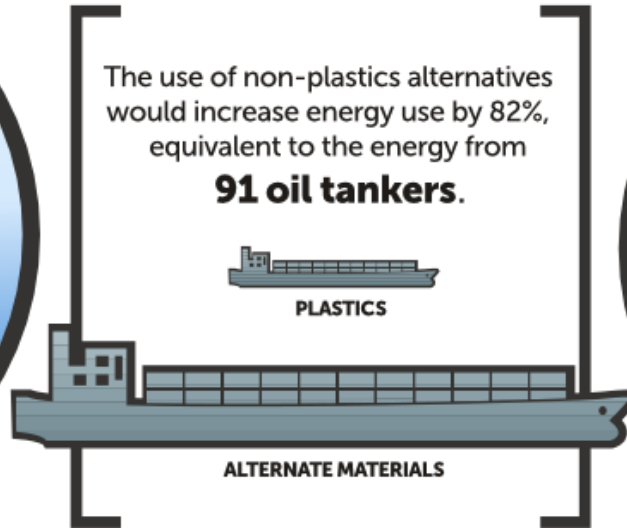
Using only a few grams of flexible plastic packaging extends the shelf life of a cucumber by more than three times.



FLEXIBLE PLASTIC PACKAGING
HELPS IN-STORE WASTE
REDUCE
3 percent to under 1 percent
BY **INCREASING**
SHELF LIFE



LCA Studies on Packaging



Most plastics can be recycled



Stand-up pouch packaging reduces waste and brings energy savings



Package Type	Contents	Impact per 100 oz Cereal		
		Landfill Discards* (g)	Process GHG** (kg CO ₂ Eq)	Total Energy** (MJ)
Paperboard and HDPE Liner	11 oz	380.0	.861	12.1
Stand-Up Pouch	12 oz	117.5	.265	9.25

Reduction vs Box	
Landfill Discards	68%
GHG	69%
Energy	23%

Flexible Packaging Examples

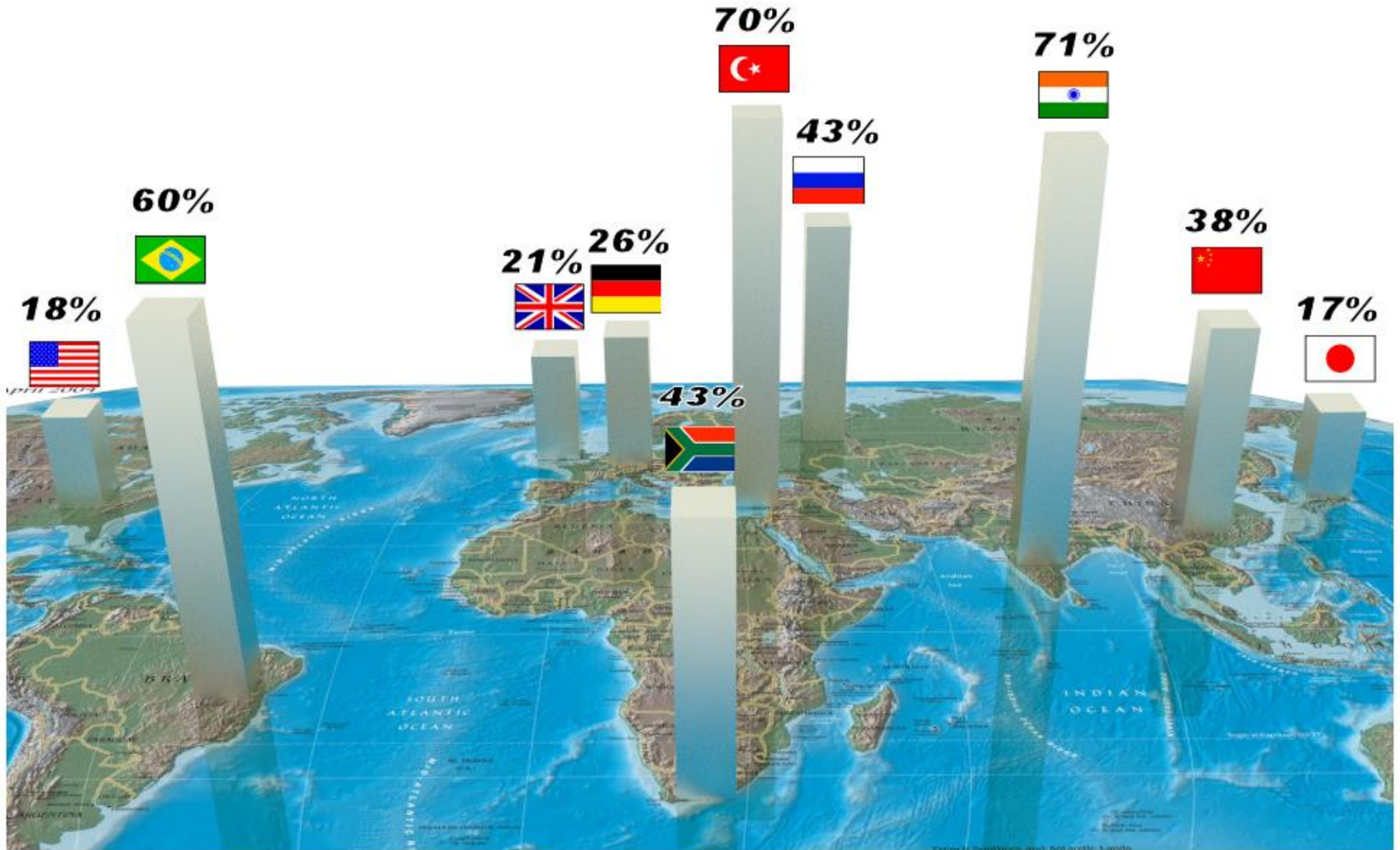


greenerpackage.com



nestle-shop.ch

Packaging Satisfaction



% who say packaging is important to overall product satisfaction



Food Packaging



Modern agriculture is the use of land to convert petroleum into food.

Al Bartlett

**40 kWh/kg
~22% wasted**

Pimentel and Pimentel, 2003

FAO, 2012

CO₂e

13X bigger for beef

chicken

Benefit



Expenditure



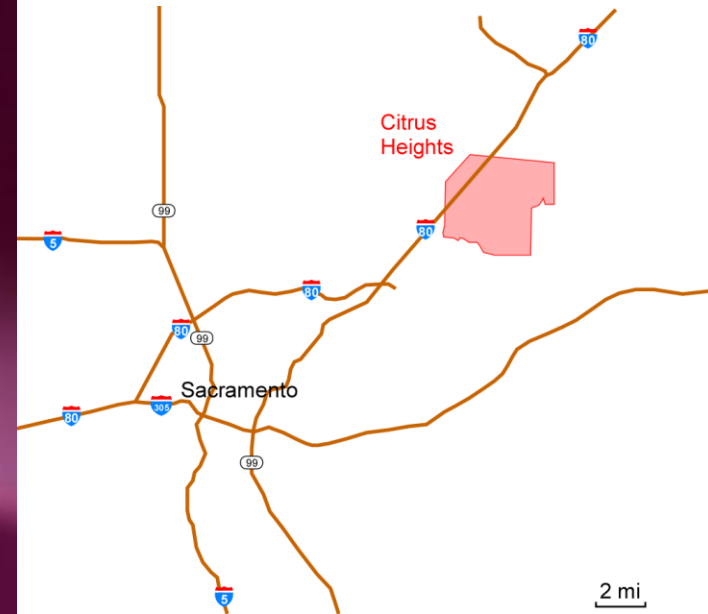
} Avoided Waste?



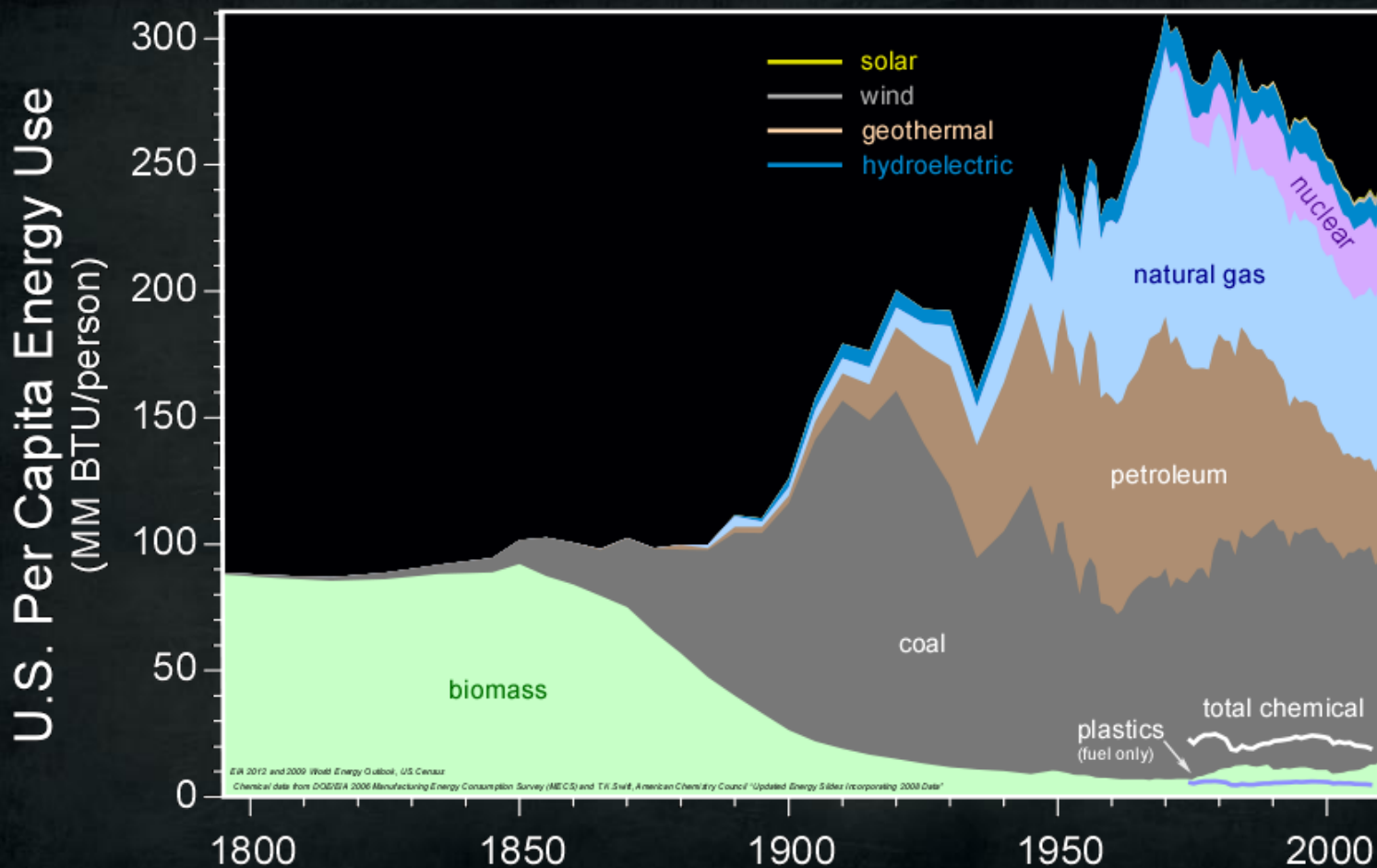
Waste Reduction Hierarchy



Explore New End of Life Options



Per Capita Energy Use



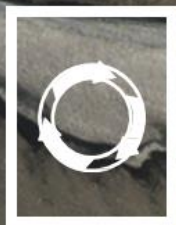
2025 Sustainability Goals



Leading the
Blueprint



Delivering
Breakthrough
Innovations



Advancing a
Circular
Economy



Valuing
Nature



Increasing
Confidence in
Chemical
Technology



Engaging
Employees for
Impact



World-Leading
Operations
Performance

2025 Sustainability Goals

Dow is redefining
the role of business
in society.



Through our 2025 Sustainability Goals, Dow will advance the well-being of humanity by helping lead the transition to a sustainable planet and society, maximizing economic, environmental and societal value.

2025 Sustainability Goals



Leading the Blueprint

Dow leads in developing a societal blueprint that integrates public policy solutions, science and technology, and value chain innovation to facilitate the transition to a sustainable planet and society.



Delivering Breakthrough Innovations

Dow delivers breakthrough sustainable chemistry innovations that advance the well-being of humanity.



Advancing a Circular Economy

Dow advances a circular economy by delivering solutions to close the resource loops in key markets.



Valuing Nature

Dow applies a business decision process that values nature, which will deliver business value and natural capital value through projects that are good for business and good for ecosystems.



Increasing Confidence in Chemical Technology

Dow increases confidence in the safe use of chemical technology through transparency, dialogue, unprecedented collaboration, research and our own actions.



Engaging Employees for Impact

Dow people worldwide directly apply their passion and expertise to advance the well-being of people and the planet.



World-Leading Operations Performance

Dow maintains world-leading operations performance in natural resource efficiency, environment, health and safety.



