

# Connecting the Dots

*The Intersection  
of Plastics,  
Energy and  
Planetary Health*



<https://www.insurancejournal.com/magazines/mag-coverstory/2019/05/20/526867.htm>

# Running in Circles for 4 Decades

**Material  
Solutions**



**Material  
Solutions**

*Delivering resource efficiency solutions*



**Dr. Mike Biddle, Founder, MBA Polymers**

**CEO, Material Solutions**

**Managing Director,  
Evok Innovations**



**Because sustainability matters.**

# Work and Life Navigation Questions

1. Why Are We Here?

*Purpose*

2. Where Do We Want to Go?

*Vision*

3. How Do We Get There?

*Strategy*

4. Who Will Get Us There?

*Responsibility*

# Why am I here?

Why did I spend nearly 40 Years Playing  
with Plastics?

$$y = a \cdot b^x$$

# In the 70's, **PLASTICS** were the “grooviest” materials on the planet



<https://www.sciencehistory.org/distillations/plastic-town>



alamy stock photo

CWKPMY  
www.alamy.com



<https://learning.knoji.com/groovy-space-age-design/>



<http://www.halloweencostumes.net/green-polyester-leisure-suit.html>

# A Material of the “Space-Age”



<https://clickamericana.com/topics/places/monsanto-home-of-the-future-at-disneyland-1965>



## Throwaway Living

DISPOSABLE ITEMS CUT DOWN HOUSEHOLD CHORES

<https://medium.com/@uwcampuscompost/we-tried-going-2-weeks-without-single-use-plastics-part-i-heres-what-happened-905760f29276>

“I have One Word For You...”

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Plastics!



<https://www.youtube.com/watch?v=eaCHH5D74Fs>

# And Was He Ever Right!

Source: [UN GRID-Arendal](https://www.darrinqualman.com/global-plastics-production/)

<https://www.darrinqualman.com/global-plastics-production/>

Source: Ryan, A Brief History of Marine Litter Research, in M. Bergmann, L. Gutow, M. Klages (Eds.), Marine Anthropogenic Litter, Berlin Springer, 2015; Plastics Europe

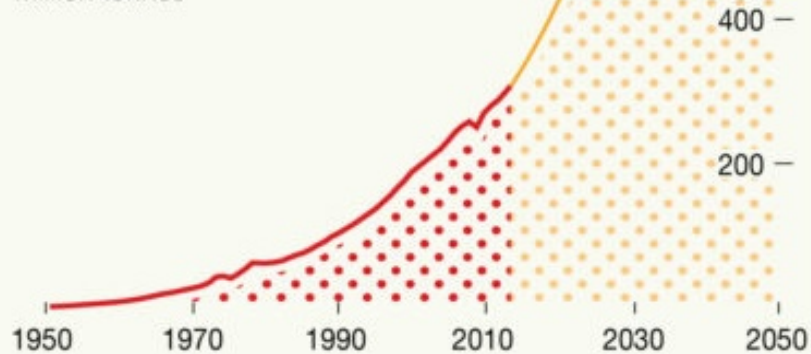
## Global plastic production...

Million tonnes, 2013



## ...and future trends

Million tonnes





# And remember that simple equation?

**Definition:**

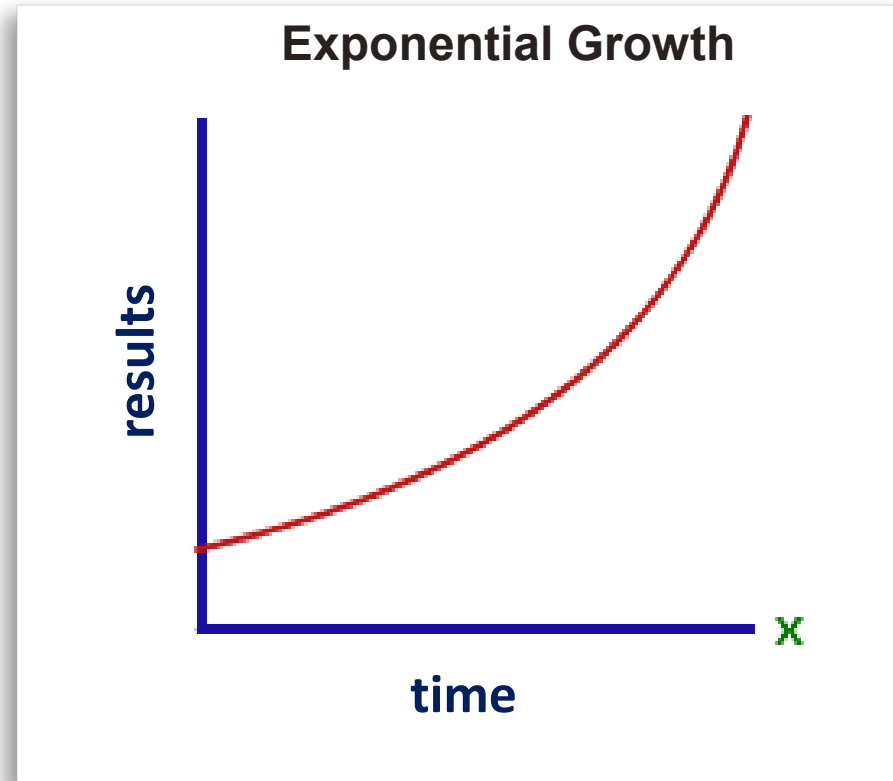
An **EXPONENTIAL FUNCTION** is a function of the form:

$$y = a \cdot b^x$$

Constant  $\swarrow$   $a$   $\cdot$   $b$   $\searrow$   $x$   
Base Exponent

Where  $a \neq 0$ ,  $b > 0$ ,  $b \neq 1$ ,  
and  $x$  is a real number.

<http://lugezi.com/images/>



70's

## The Gas Crisis Decade

80's

## The Garbage Crisis Decade

**“Over Half of US Cities will exhaust current landfills by 1990” WorldWatch Inst., 1987**



[National Museum of American History - Smithsonian Institution](https://www.si.edu/explore/first-day-gas-rationing-california) First day of gas rationing, California, May 9, 1979

<https://content.fortune.com/wp-content/uploads/2015/09/gettyimages-97318701.jpg?quality=80>

# Pivot #1, Act 2:

## Can We Turn Lemons into Lemonade?

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Innovation

Forbes

# Junk Into Money

Here's one fellow who has no objection to \$65 oil: a plastics recycler | By Kerry A. Dolan

**C**ACOPHONY REIGNS INSIDE Michael Biddle's 45,000-square-foot recycling plant in Richmond, Calif. Pieces of fax machines, telephones, keyboards and cell phones are fed into green hoppers

atop 20-foot-tall chutes. Pipes and conveyor belts run everywhere. Amid the whirring fans and clanging grinders, you can pluck out the sounds of metal clinking as it gets sucked out by ejectors, plastic ping as it is pulled away from foil and paper, air jets whooshing as they separate light-color plastic from dark. Out the end come gray pellets, sorted into six or more grades of reusable plastic.

To Biddle it's a symphony, the result of nearly two decades of hard work. He claims to be the first to figure out how to take nearly any kind of plastic trash, which is usually a mongrel blend of up to 20 different plastics, and separate it by chemical

type. Biddle's factories make the three important plastics used in durable goods and electronics: polypropylene, acrylonitrile butadiene styrene (alias ABS) and polystyrene. "We're changing the way plastic is made, just like minimills changed the way steel was made," he says.

Every year 40 million tons of plastic—in cars, refrigerators, personal computers, fax machines, coffeemakers, food bins, bottles and so on—are dumped in landfills in the U.S. Landfill space happens to be plentiful at the moment, but it might not be for long, and in any event many Americans are wracked with guilt at the notion of all this compressed garbage sitting around. Pressure to recycle is building. In Europe it is mandatory for producers of electronic goods to take back their products and recycle them.

The swelling waste stream is the fuel for Biddle's MBA Polymers. "They're clearly pioneers. If anybody's in a position to suc-



IN

RESOURCE DEPLETION

RESOURCE DEPLETION

**“YOU SEE GARBAGE...****WE SEE ABOVE-GROUND MINES”**

Why Mike Biddle, founder of MBA Polymers, sees resource depletion as a major investment opportunity, and why you should too

WORDS: CRIS HEATON, PAUL TYRRELL  
PHOTOGRAPHY: HARRY BORDEN

# Great Mike, but does the World Really Care?

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The Economist's  
**INNOVATION  
AWARD  
WINNER  
2010**



The 2012  
Göteborg Award  
"The Nobel Prize  
in Environment"

WINNER:  
ENERGY AND THE ENVIRONMENT

*Michael Biddle*

The 2017 SME  
Circulars  
Award



  
**MBA POLYMERS**  
BECAUSE SUSTAINABILITY MATTERS

*The Davos Prize*

The Audience voted MBA the  
**overall winner** from the 7  
category winners including  
**Patagonia, Nike, the Scottish  
Government and others.**

# Pivot #2, Act 3: What Next?

**How Do I Best Leverage What I Learned?**

**How Do I Continue Working on Stuff I Care About?**

**Trying to Solve Big and Important Problems**

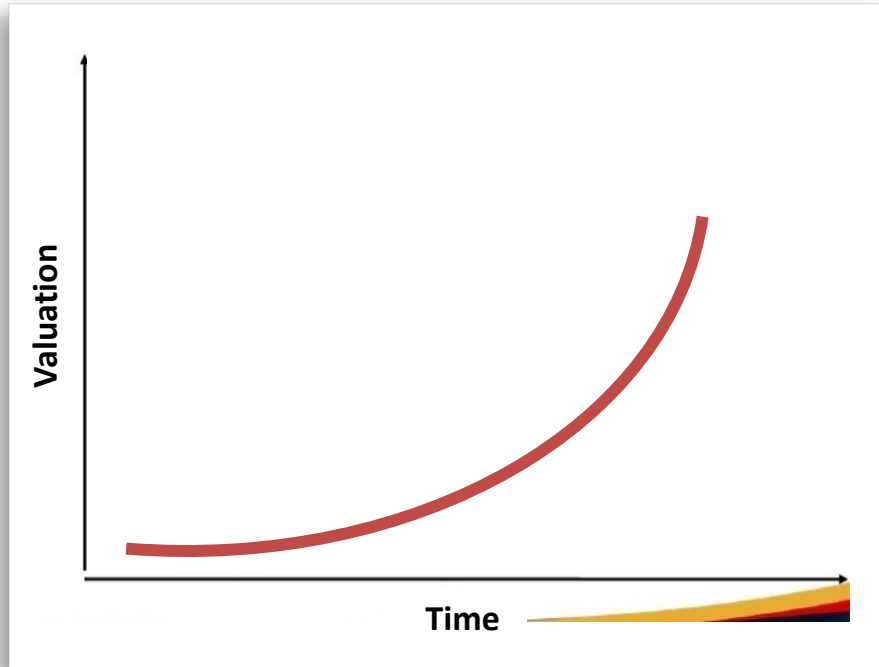
**Cool Technology**

**Other Highly Motivated People**

**And Let's  
not Forget**

$$y = a \cdot b^x$$

# Investors Like Curves that Go Up and to the Right



**Venture-backed companies with quick \$1 Billion valuations**

<https://www.slideshare.net/stevekeifer/b2b-emarketplaces-rise-and-fall-by-steve-keifer/9-Hockey Stick Revenue Growth Investors>

[https://ichef.bbci.co.uk/news/1024/cpsprodpb/16A94/production/\\_87602829\\_unicornphoto.jpg](https://ichef.bbci.co.uk/news/1024/cpsprodpb/16A94/production/_87602829_unicornphoto.jpg)

**The reality is closer to:**

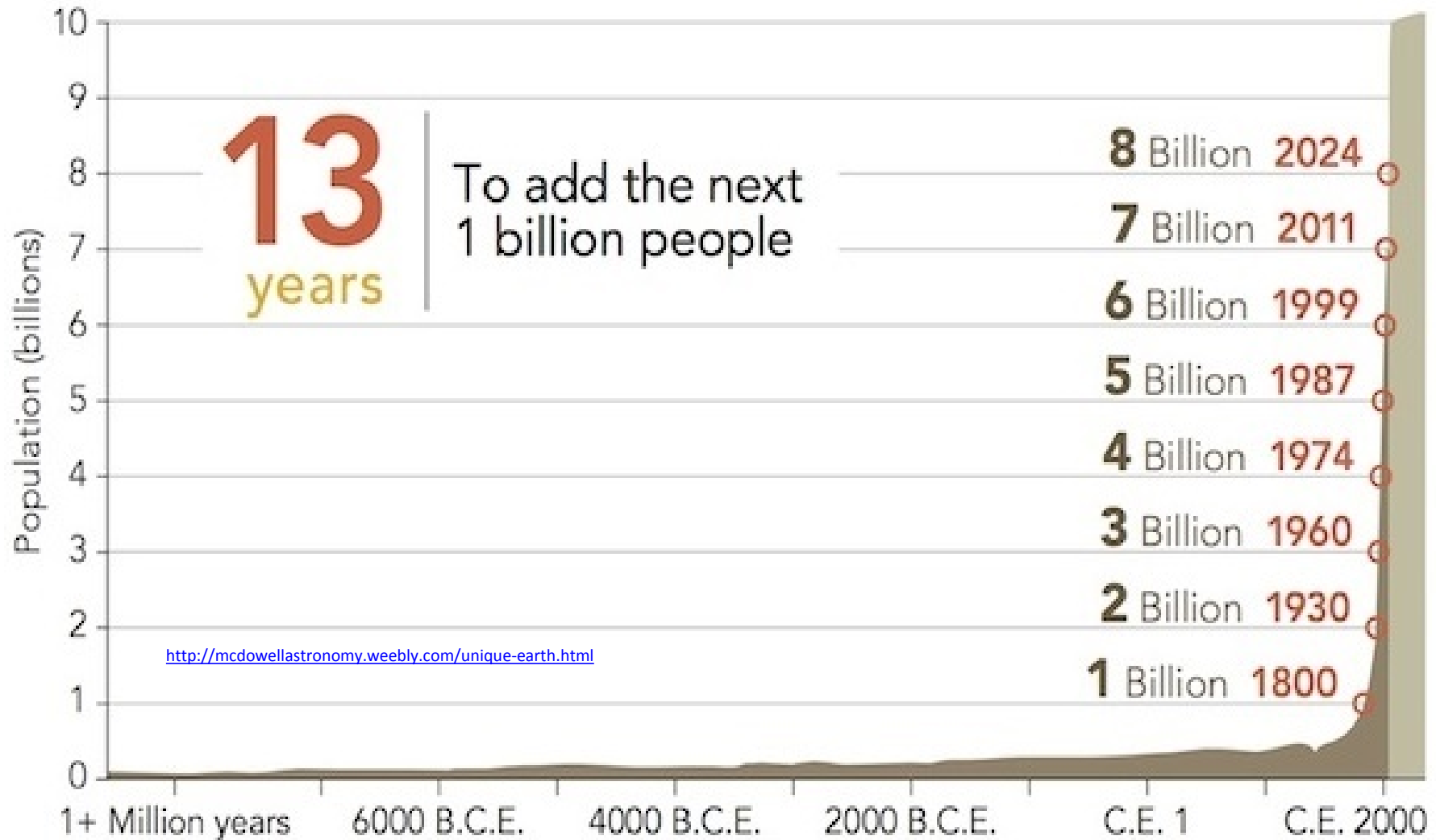
**And much of CleanTech involves “HardTech” or “ToughTech”**



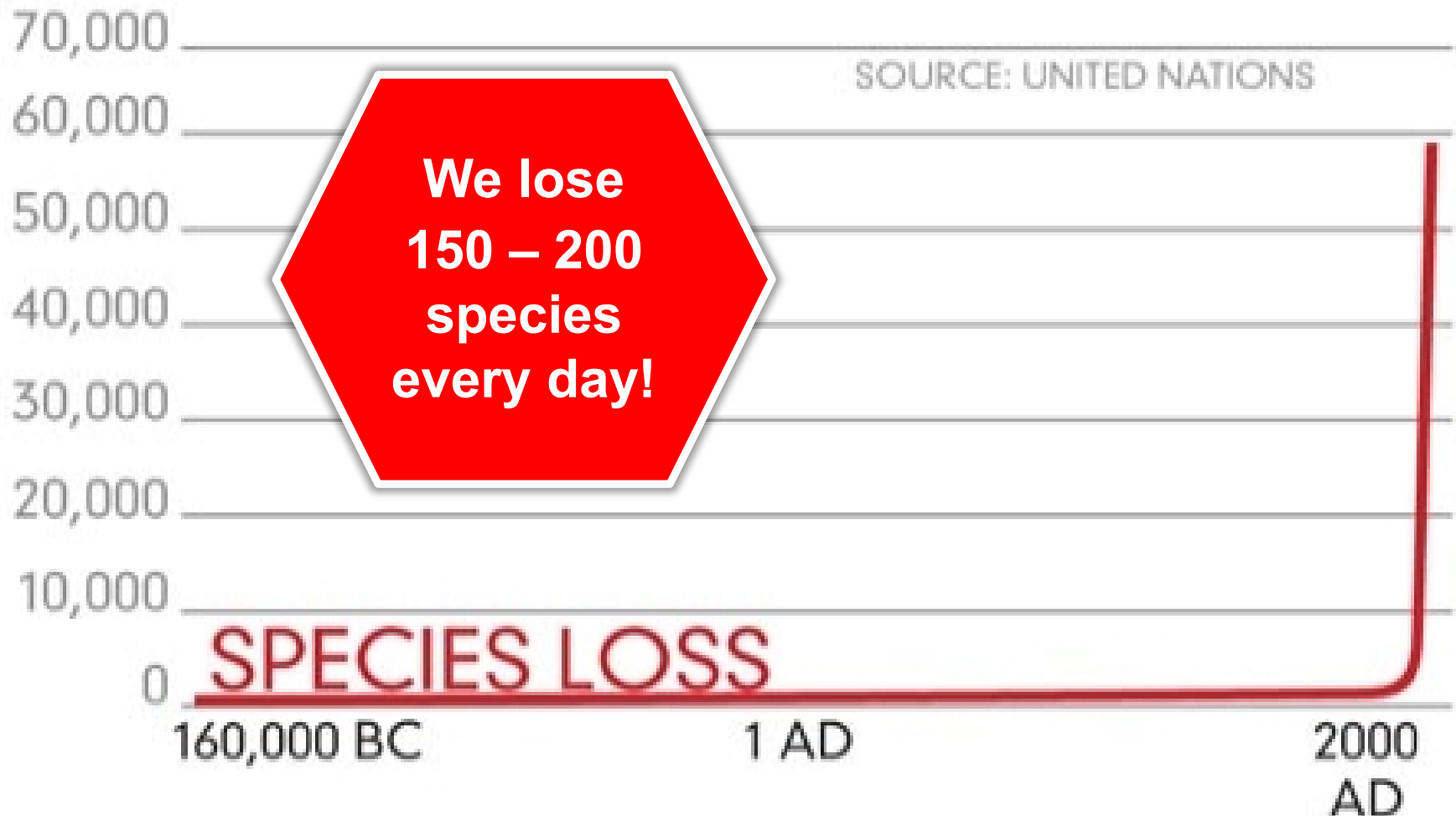
**Which  
means lots  
of time and  
money**



# I believe there are a number of areas with more **URGENT & REAL** exponential growth

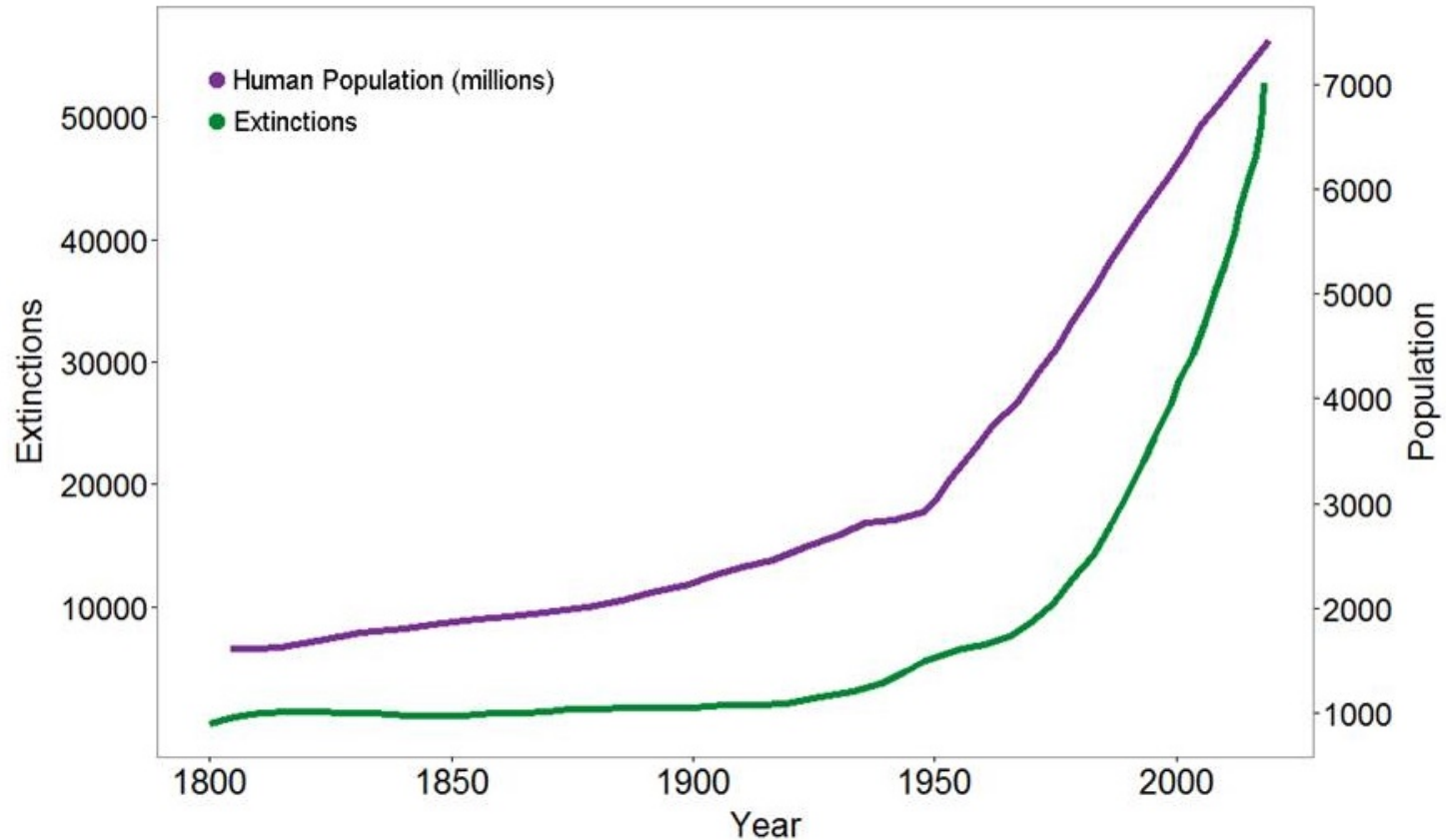


# Exponential LOSS vs Growth for many of Earth's inhabitants



Might these two dramatic trends be related?

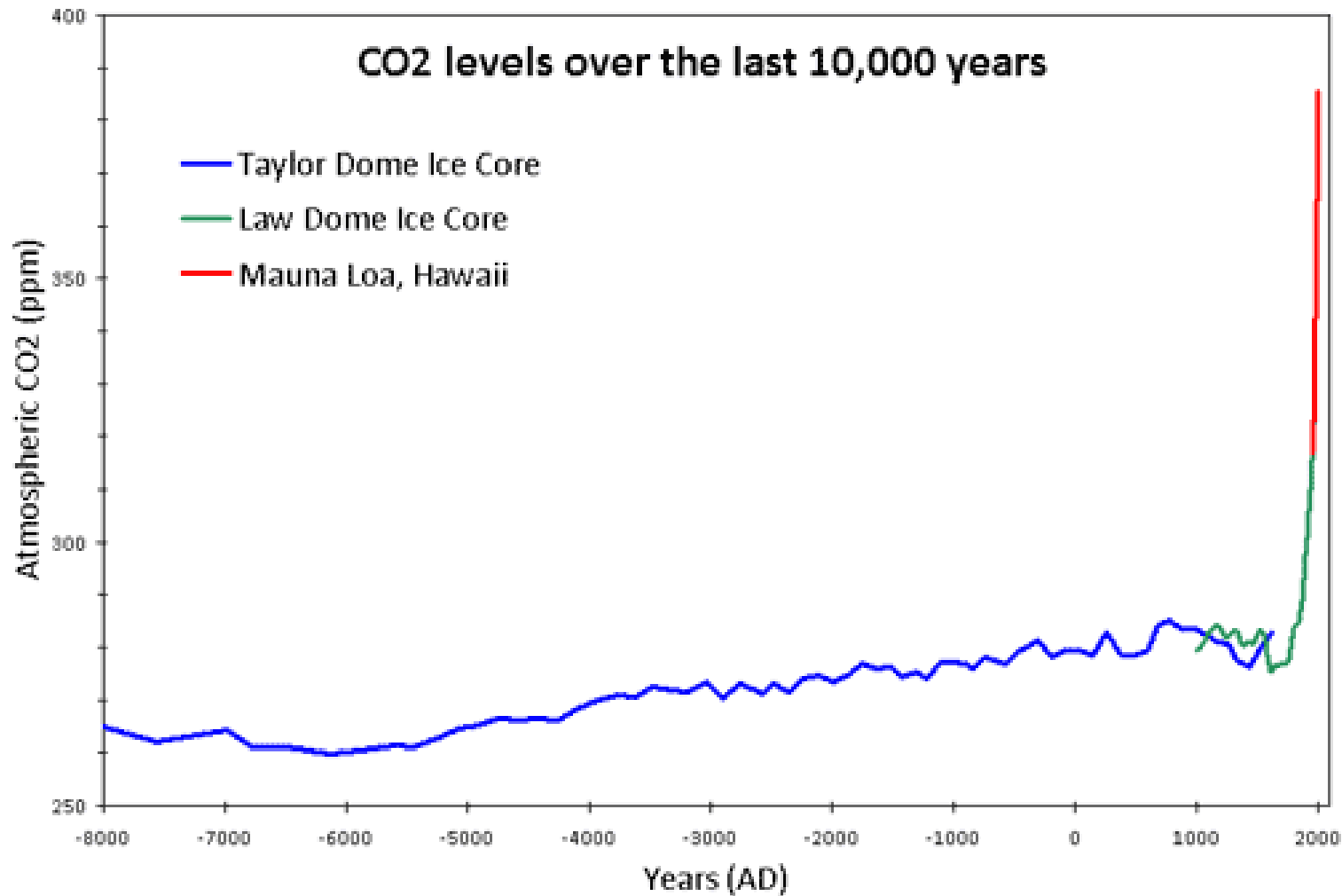
# Humans & The Extinction Crisis



Data source: Scott, J.M. 2008. *Threats to Biological Diversity: Global, Continental, Local*. U.S. Geological Survey, Idaho Cooperative Fish and Wildlife, Research Unit, University Of Idaho.

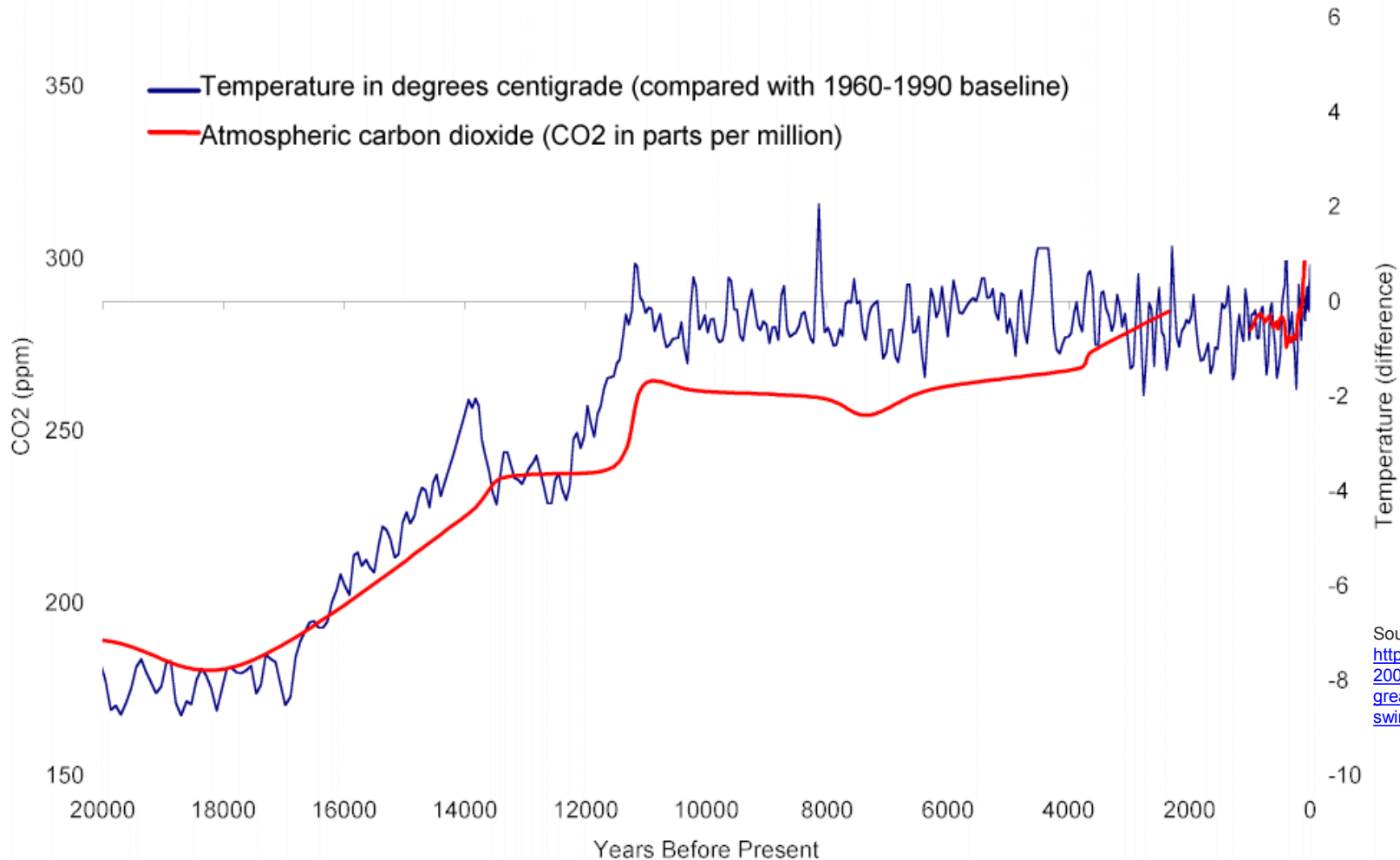
# Attracted to Tackling Difficult Waste Problems

## How About “invisible” wastes?



<https://skepticalscience.com/Is-CO2-a-pollutant.html>

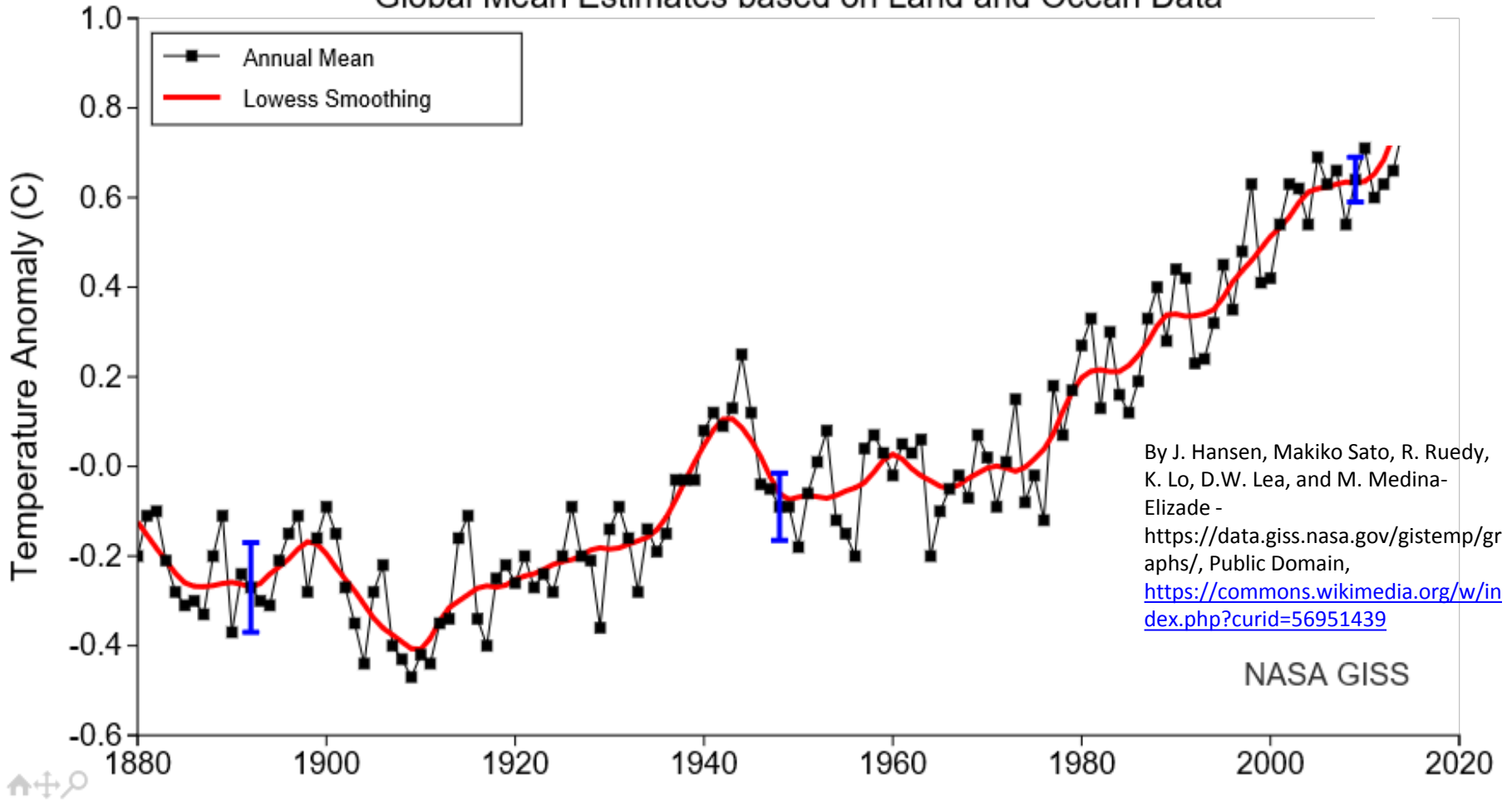
# Might CO<sub>2</sub> and global temperature be related?



Source:  
<https://roadsofstone.com/2007/03/06/140-the-great-global-warming-swindle/>

# Last 100 or so years

Global Mean Estimates based on Land and Ocean Data

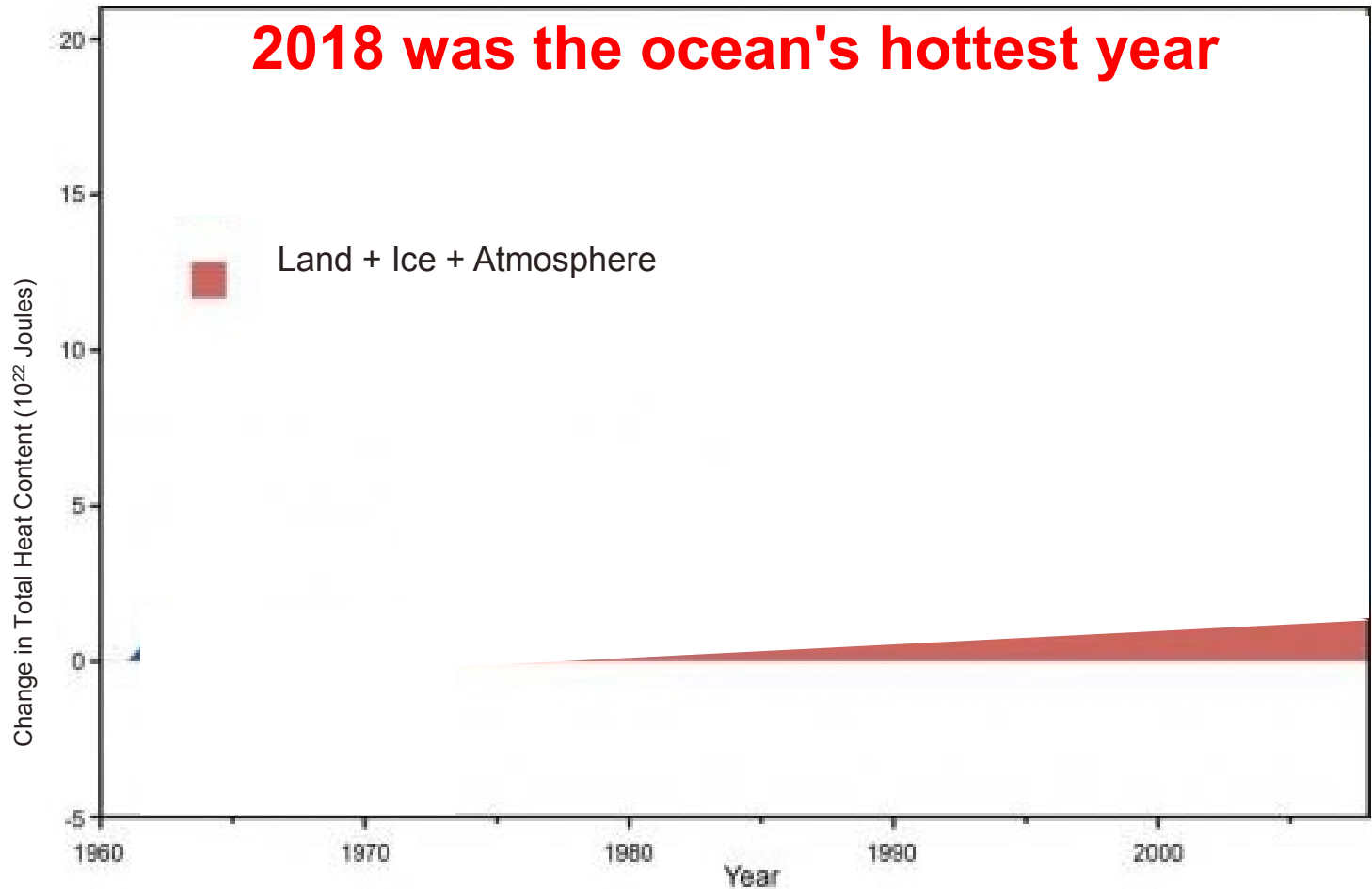


# The Earth is a REALLY big Mass

## The Oceans have been our heat sink up to now

Heat  
Content,  
 $10^{22}$  Joules

<https://www.skepticalscience.com/4-Hiroshima-bombs-worth-of-heat-per-second.htm>



# Ocean Warming and Acidification – HUGE impact on Marine Life

## Ice Starts Melting – Sea Levels Start Rising

### The Washington Post

“The Eemian period, between 130,000 and 115,000 years ago, also featured sea levels **6 to 9 meters above current levels**, with global temperatures not much warmer than our current era.”

[https://www.washingtonpost.com/news/energy-environment/wp/2016/03/30/antarctic-loss-could-double-expected-sea-level-rise-by-2100-scientists-say/?utm\\_term=.8fb66f78d3ea](https://www.washingtonpost.com/news/energy-environment/wp/2016/03/30/antarctic-loss-could-double-expected-sea-level-rise-by-2100-scientists-say/?utm_term=.8fb66f78d3ea)



The **Antarctic** ice sheet has been more buffered from warming so far, but that appears to be changing, and would raise the ocean by **60 meters** if it melted.

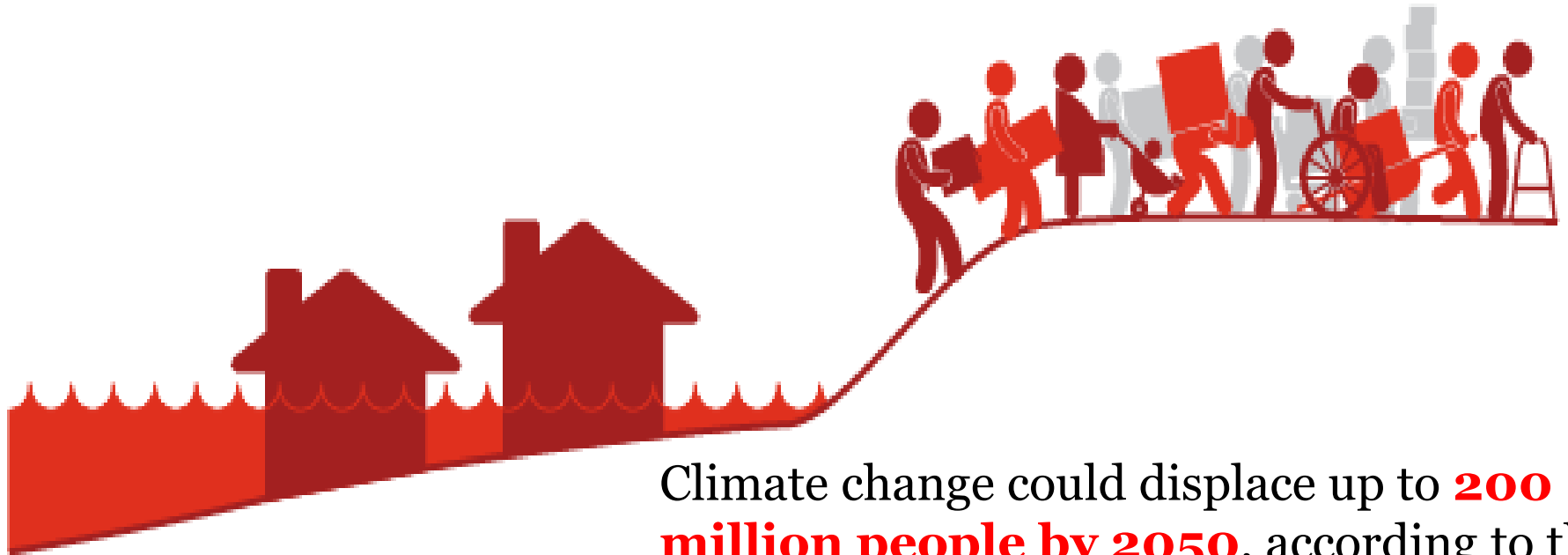
<http://www.mnn.com/earth-matters/climate-weather/blogs/facts-about-sea-level-rise>



# 150-200 million

people will be on the move...

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Source: [Climatecentral.org](http://Climatecentral.org)

Climate change could displace up to **200 million people by 2050**, according to the United Nations Institute for Environment and Human Security and the International Organization for Migration

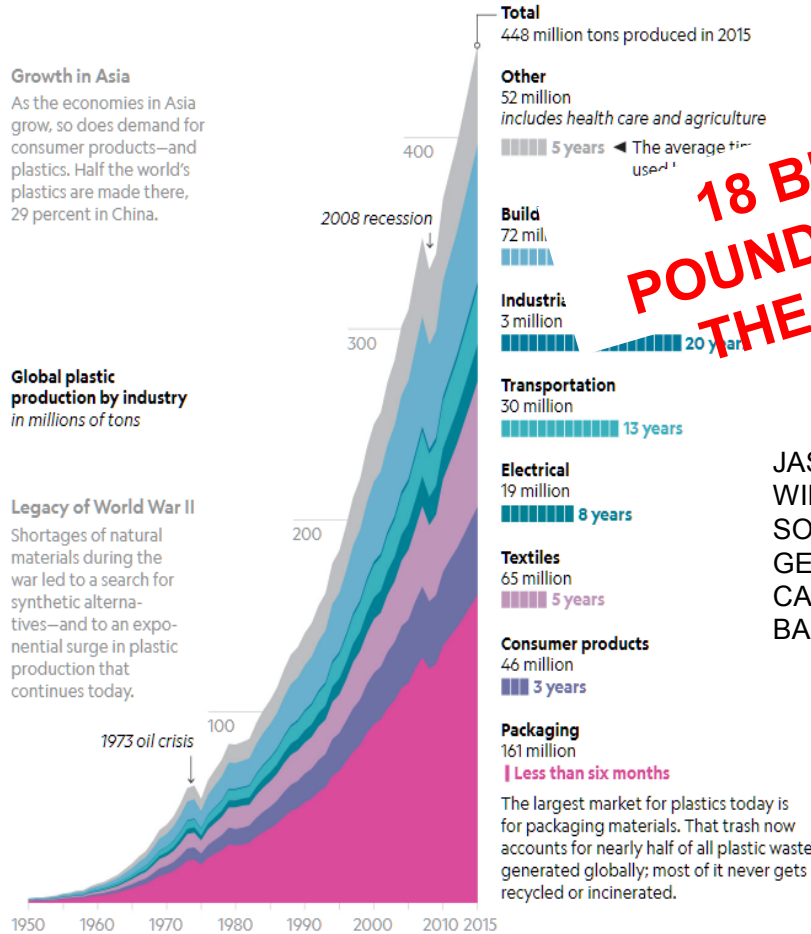
<http://www.csmonitor.com/Environment/2016/0503/First-US-climate-refugees-get-48-million-to-move>

# Oceans Under Stress from Many Directions



## A LIFETIME OF PLASTIC

The first plastics made from fossil fuels are just over a century old. They came into widespread use after World War II and are found today in everything from cars to medical devices to food packaging. Their useful lifetime varies. Once disposed of, they break down into smaller fragments that linger for centuries.



**18 BILLION POUNDS/YR INTO THE OCEANS**

JASON TREAT AND RYAN WILLIAMS, NGM STAFF SOURCE: ROLAND GEYER, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

<https://www.nationalgeographic.com/magazine/2018/06/plastic-planet-waste-pollution-trash-crisis/>

# 'Out to Sea – The Plastic Garbage Project' at the Zurich Museum of Design.

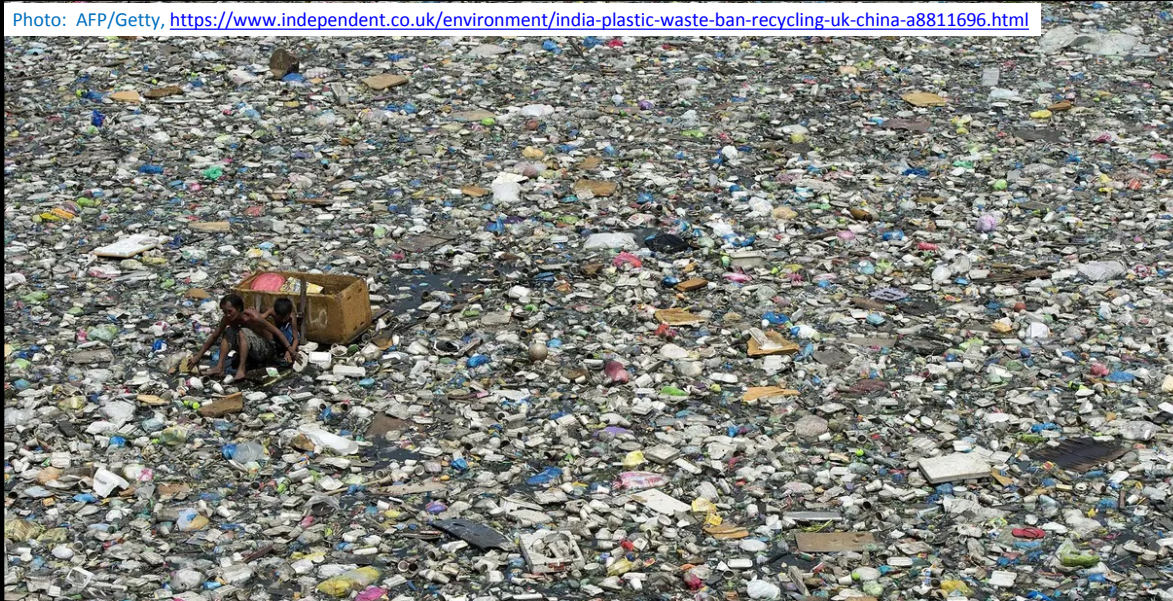
**Every 15 seconds**

A large, colorful pile of plastic garbage, including bottles, containers, and debris, is displayed in a museum hallway. The pile is made up of various types of plastic waste, such as water bottles, food containers, and other household items. The hallway has a polished floor and white walls. A person is visible in the background on the left side of the image.

Photo: Vegalante

It's estimated that this amount of plastic  
garbage is released to the sea

Photo: AFP/Getty, <https://www.independent.co.uk/environment/india-plastic-waste-ban-recycling-uk-china-a8811696.html>



<https://www.stuff.co.nz/world/asia/69962756/horrific-life-of-philippines-poorest-children-swimming-in-rubbish-for-165-a-day>



<https://publiclab.org/notes/Johudson1/06-22-2015/solutions-to-plastic-pollution>



<https://learningenglish.voanews.com/a/health-environmental-pollution-kills-millions/3780544.html>

# “More Plastic than fish by 2050”



<https://www.bbc.com/news/science-environment-45509822>



<https://www.nwf.org/Magazines/National-Wildlife/2019/June-July/Conservation/Ocean-Plastic>



<https://www.globalanimal.org/wp-content/uploads/2011/07/whale-in-pollution.jpg>

<https://galeri.uludagsozluk.com/g/k%C3%B6t%C3%BCI%C3%BCk-denince-akla-gelenler/>

<https://pittifulnews.files.wordpress.com/2014/03/7d110-plasticpic.jpg>



88 pounds of plastic trash in the stomach of a Cuvier's beaked whale that washed ashore in the Philippines

115 plastic cups, four plastic bottles, 25 plastic bags, 2 flip-flops, a nylon sack and more than 1,000 other assorted pieces of plastic in stomach of sperm whale in Indonesia



<https://people.com/pets/dead-cuvier-beaked-whale-plastic-bags-in-stomach/>

<https://www.cbc.ca/news/technology/indonesia-whale-ocean-plastics-1.4912654>

# Where Else Do We Find Plastics?

**Bottled Water**

**Beer**

**Sea Salt**

**Every Corner of the Globe!**



**Rocky Mountain Snow  
and Rain**



**The Alps**

**Arctic Snow**

**Newsweek**

**Bavaria: up to 150,000 particles per  
liter**

**Arctic: highest sampling was 14,000  
per liter**

## WIRED

# Your Poop Is Probably Full of Plastic

A new study suggests that microplastics routinely show up in our food—and our

United European Gastroenterology meeting in Vienna, researchers announced they have detected microplastics in stool samples from every single one of a small group of international test subjects – 8 different countries



# Where Do We Want to Go?

**Not Here**

**Towards More Sustainable Business Models  
and Communities**

**A Future Where Our Descendants will enjoy  
all of the *benefits we take for granted***

**How** do we turn these enormous challenges into opportunities?

# Ban Plastics?



## “Plastic: The Ocean’s Deadliest Predator” Campaigns Against Plastic

**PLASTIC IS RUBBISH**  
why we boycott plastic....



10 WAYS to end your relationship WITH PLASTIC

Dear Plastic, It's over. ~~It's not you~~ It's you. I deserve way better. XO XO

www.bodyunburdened.com

**GO PLASTIC-FREE!**

**PLASTIC SUCKS!** 20 SIMPLE EVERYDAY TIPS TO LOWER YOUR PLASTIC CONSUMPTION

NTR nontoxicrevolution.org

**EAST RAY EXPRESS**

Shedding Plastic

Becca Terry is almost living plastic-free. By Nate Salterich



## Why India Passed One Of The World's Toughest Anti-Plastic Laws



# Would Banning Plastics Lead us to a Better Future?

Plastics are often the most efficient & best environmental materials choice

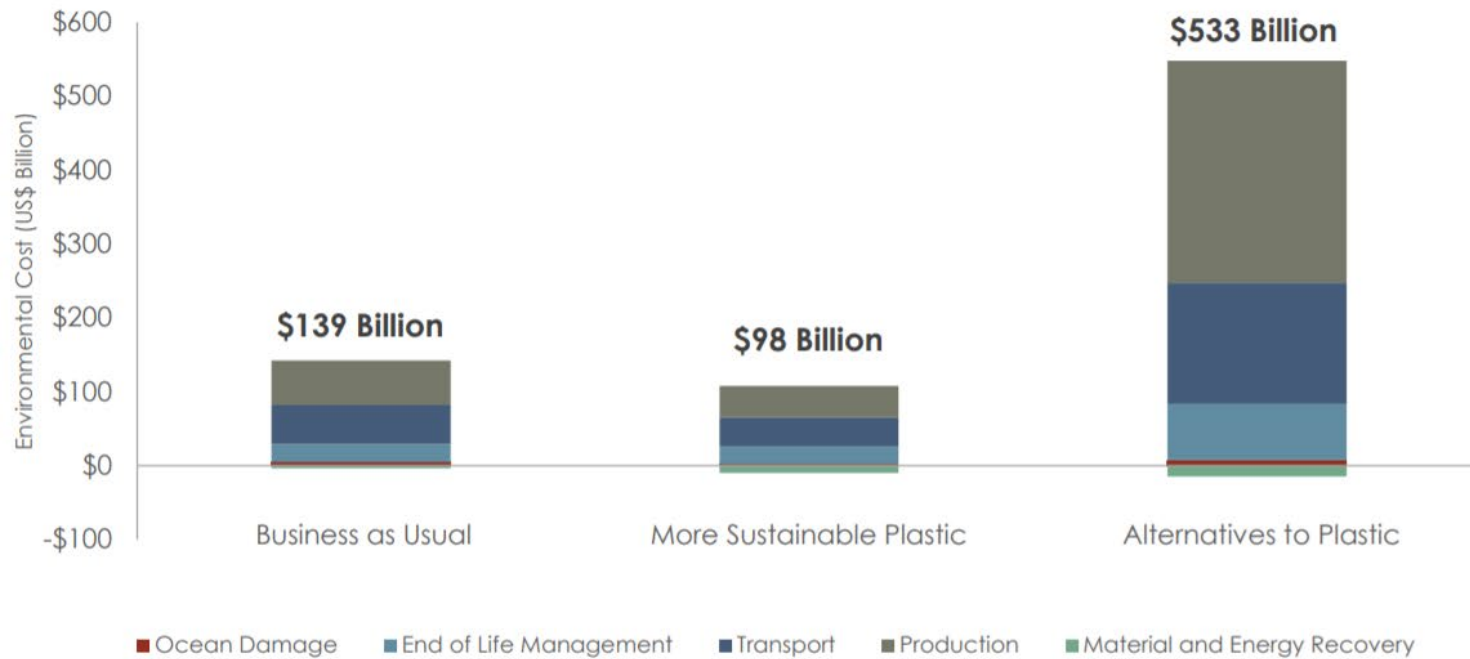
Resource efficiency of plastics in the automotive sector  
Fender case study: plastics versus traditional materials



Source: Beyond "carbon footprint": The contribution of plastic products to various resource savings – denkstatt GmbH, Vienna, 2012

# Plastics are usually the best alternative from many perspectives

Figure 1: The Environmental Cost of Business as Usual Plastic, Alternatives to Plastic and a More Sustainable Plastic in Consumer Goods

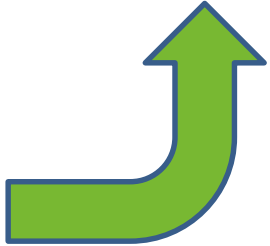
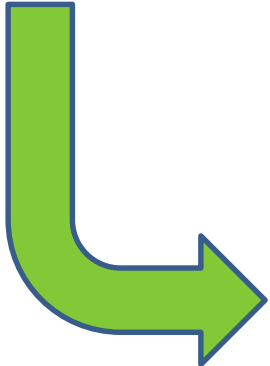


Source: Trucost

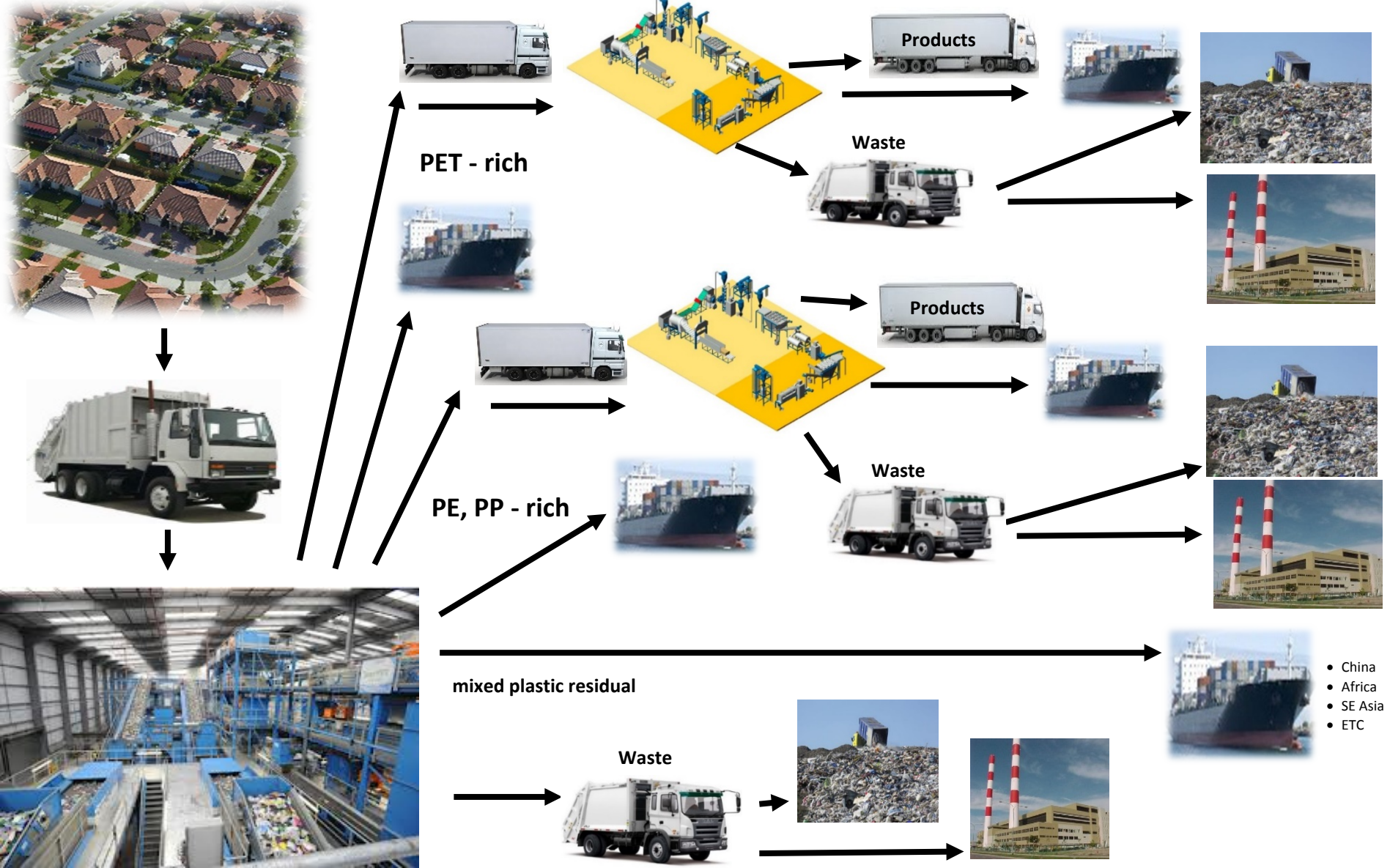
<https://plastics.americanchemistry.com/Plastics-and-Sustainability.pdf>

# We Must Close the Loop

## Evolution of Household Waste Recycling



# Evolution to Single Stream and MRFs







Over 180 countries -- **not including the US**  
-- agree to restrict global plastic waste  
trade

<https://www.cnn.com/2019/05/11/world/basel-convention-plastic-waste-trade-intl/index.html>

By [Rob Picheta](#) and Sarah Dean, CNN  
Updated 9:39 AM ET, Sat May 11, 2019



Landmark UN plastic waste  
pact gets approved **but not**  
**by US**

<https://abcnews.go.com/Politics/wireStory/landmark-plastic-waste-pact-approved-us-62976388>

BY THE ASSOCIATED PRESS

GENEVA — May 11, 2019, 5:39 AM  
ET

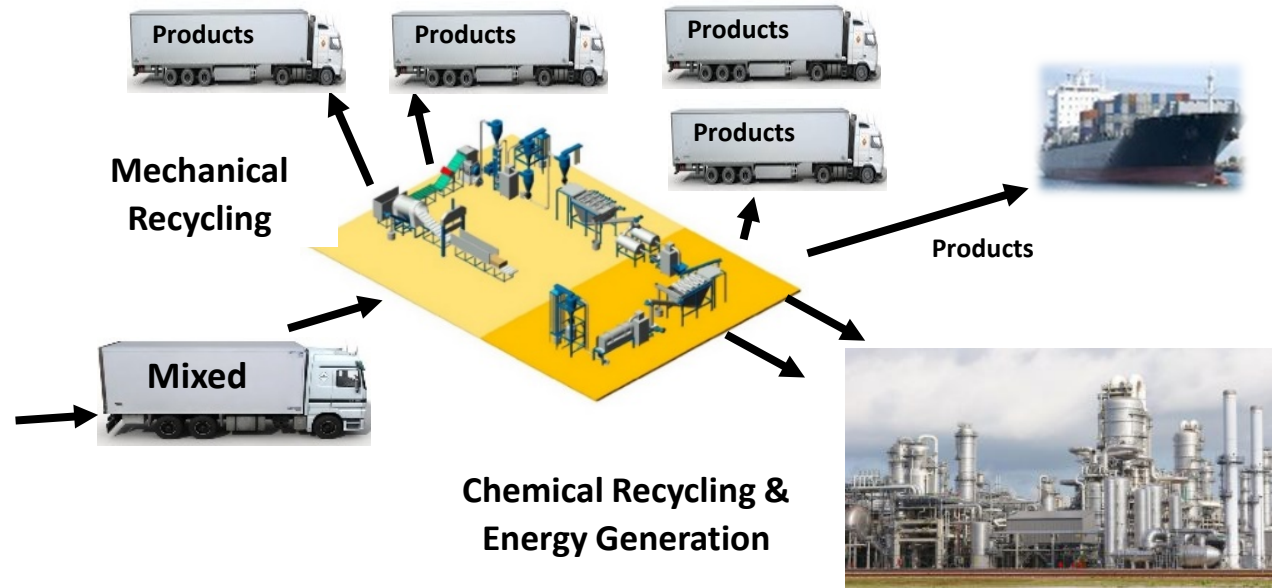
# The Future will be simpler & more profitable



**TOUCH IT  
ONCE  
AND  
MOVE  
ON**

- Less handling/transport costs
- Economies of Scale
- Larger Markets for Products
- Near Zero Waste

**Therefore plastics will be  
even more Sustainable**





**Who** will turn these enormous challenges into opportunities?

# What About the Usual Suspects?

**Government and NGOs?**

**Industry, Large Companies?**

**SMEs (Small to Medium Enterprises)?**

**Individuals?**

# Big companies?



## Reduction of CO<sub>2e</sub>

1,000,000 MT from 2008-2014

167,000 MT per year on average

1 MT/yr per Unilever employee

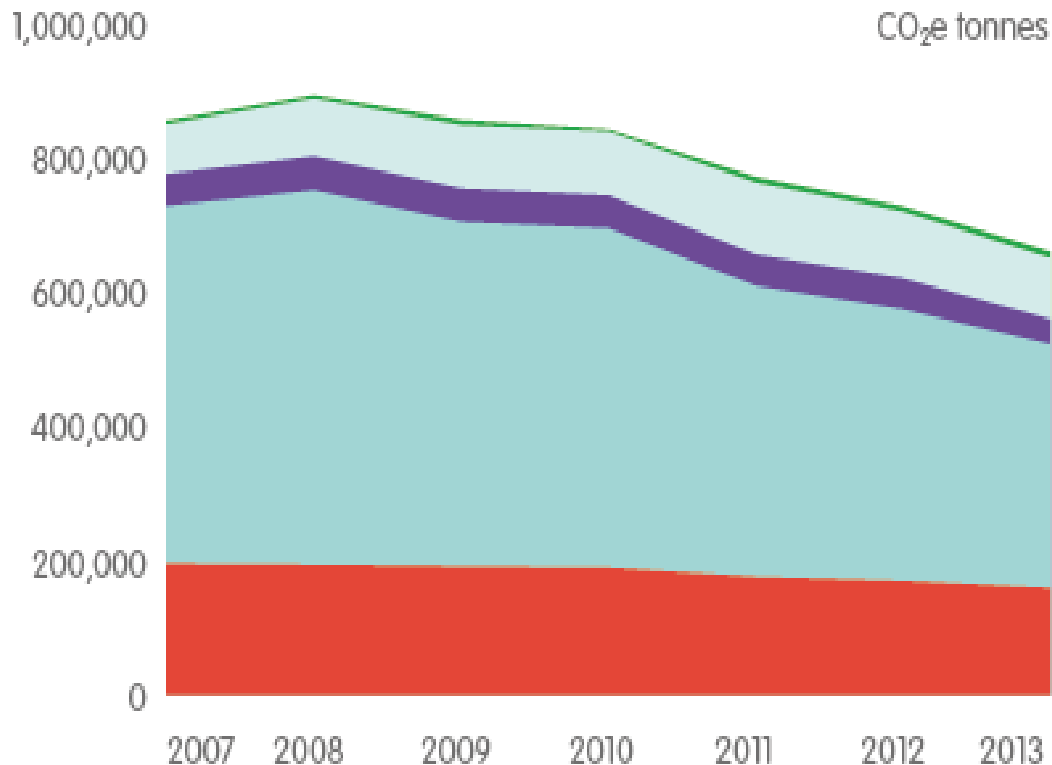


2014 GlobeScan/ SustainAbility Survey

CEO Polman: 'Unilever Sustainable Living Plan', a blueprint that will lead to company **doubling in size** while **halving its carbon footprint**.



## CCE's Business Operations 2007-13



Reduction of CO<sub>2</sub>e

182,000 MT from 2007-2013

26,000 MT per year on average

2 MT/yr per CCE employee

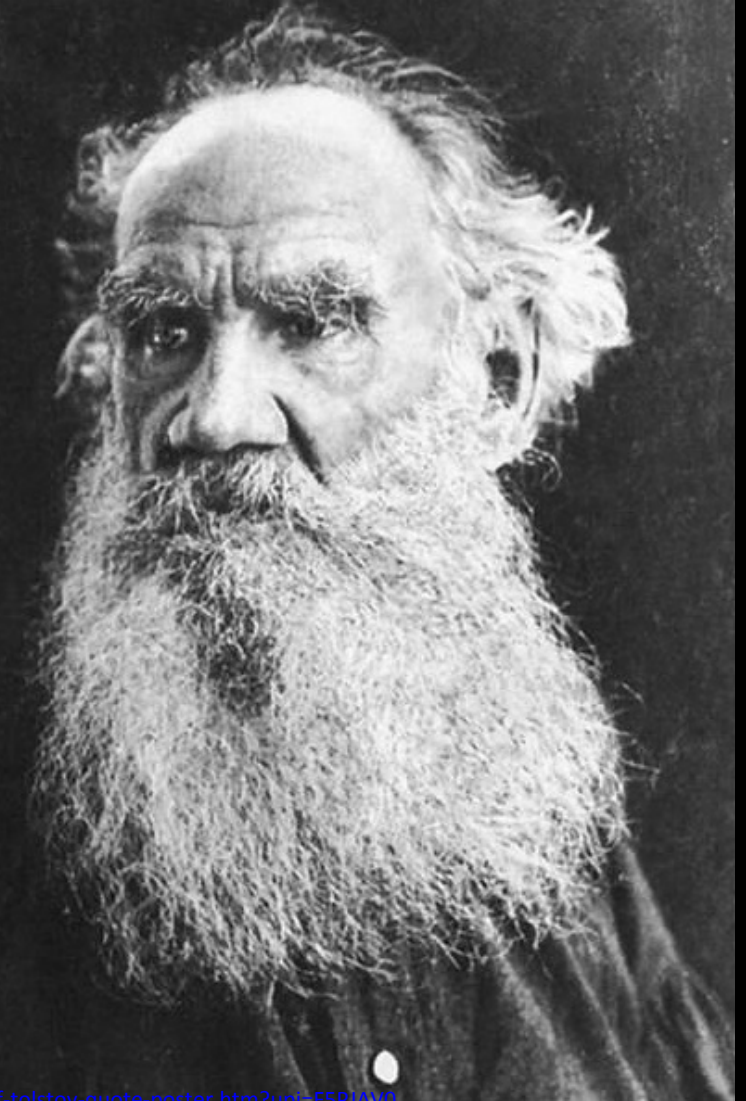
- Business travel and other
- Third Party Distribution
- CCE Fleet
- Cold Drinks Equipment
- Operations and Commercial sites

# Individuals?

## What Can Individuals Really Do?

“EVERYONE  
THINKS OF  
CHANGING  
THE WORLD,  
BUT NO ONE  
THINKS OF  
CHANGING  
HIMSELF.”

-Leo Tolstoy





# Individuals?

## Only 4 lifestyle changes



- ~ 10 going solar
  - ~ 4 using bikes & trains more than cars
  - ~ 3 air-drying clothes
  - ~ 4 going mostly vegan
- 

**~21 MT/yr for 1 family**  
**> 5 MT/yr per person**

**RT flight to DEN! (coach)**

**~ (0.5)**

## SMEs? – How many of you are SMEs?

“**Never doubt** that a small group of thoughtful, committed, citizens can **change the world.** Indeed, it is **the only thing that ever has.**”

Margaret Mead



Goalcast

**Over 90,000 MT/yr CO2 savings**

**Approx. 900 MT CO2 savings/employee!**



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

**Science of the Total Environment**

journal homepage: [www.elsevier.com/locate/scitotenv](http://www.elsevier.com/locate/scitotenv)



<http://www.sciencedirect.com/science/article/pii/S0048969715301017>

# Channeling some California messaging

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**"THE ONES WHO ARE  
CRAZY ENOUGH TO  
THINK,**

**THAT THEY  
CAN CHANGE  
THE WORLD,  
ARE THE ONES  
WHO DO."**

Steve Jobs



**YOUR LIFE  
IS YOUR  
MESSAGE  
TO THE  
WORLD.  
MAKE SURE  
IT'S  
INSPIRING.**

# Additional Resources

# TED

Ideas worth spreading

Plastics Recycling **TED** talk:  
<http://on.ted.com/j07ad>



3 minute **BIG SHFT** video:  
<http://tinyurl.com/cpee3vw>

@MikeBiddle

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[www.MaterialSolutions.net](http://www.MaterialSolutions.net)

# POPULAR SCIENCE

THE  
FUTURE  
NOW

Popular Science: "**THE GARBAGE MAN**"  
<http://www.popsci.com/article/science/garbage-man>

53

Recycling Today, Sept. 2014 on what's next for Plastics  
Recycling: <http://www.recyclingtoday.com/rt0914-michael-biddle-q-a.aspx>

