# **PLASTICS & THE ENVIRONMENT**

#### Facts for a Brighter Future

Dr. Chris DeArmitt FRSC - President Phantom Plastics LLC



# "Americans use about 500 million straws each day"

"That figure has been cited widely, appearing in stories by USA Today, CNN, The Washington Post, The Wall Street Journal, Fox News and, yes, even The New York Times.

But consider the source: The number is based on research conducted years ago by an enterprising 9-year-old Vermont boy named Milo Cress."

People are more than willing to repeat nonsense if it sounds dramatic.

How a 9-Year-Old Boy's Statistic Shaped a Debate on Straws, New York Times, Niraj Chokshi, July 19<sup>th</sup> 2018

# WHAT IS GREEN?







#### Many studies & countries - same conclusion

#### **Clemson University LCA Study**

"Our results also show that Paper bags, even with 100% recycle content, have significantly higher average impacts on the environment than either of the reusable bags or single-use plastic retail bags"

#### **UK LCA Study**

"The conventional HDPE bag had the lowest environmental impacts of the lightweight bags in eight of the nine impact categories"

#### Franklin Associates LCA

"This study supports the conclusion that the standard polyethylene grocery bag has significantly lower environmental impacts than a 30% recycled content paper bag and a compostable plastic bag"

#### **Reason Foundation LCA Study**

"Unfortunately, policymakers have been cajoled into passing ordinances that ban plastic bags. That is bad news for consumers. It is also bad news for the environment, since the public has been misled into believing that by restricting the use of plastic bags, the problems for which those bags are allegedly responsible will be dramatically reduced."

"To replace plastic bags with paper bags requires 2.7x more energy, 1.6x more carbon dioxide emissions and 17x more water usage. It has also been estimated that replacing the plastic bags in the EU would require cutting down an astonishing 2.2 million more trees per year and require 60 000 Olympic swimming pools more water."

# PET aluminium or glass?

PET is far greener than aluminium or glass

Container Type	Energy (million BTU)	Solid Waste		Greenhouse
		Weight (lb)	Volume (yrd³)	Gas (CO <sub>2</sub> equivalents)
Aluminium Can	16.0	767	0.95	2,766
Glass Bottle	26.6	4,457	2.14	4,848
PET Bottle	11	302	0.67	1,125

Lifecycle inventory of three single-serving soft drink containers, Franklin Associates, August 2009 (figures are per 100,000 ounces of soft drink) Also - T. H. Owen & K. Boyd, Beverage Container Review – Final Report, Thompson Rivers University, Office of Environment & Sustainability 2013





## **Plastic packaging vs alternatives**

Looking at the United States data alone, when compared to alternatives, production, use and disposal of plastic packaging across the six studied areas per year saves:

- enough energy to fuel 18 million passenger vehicles
- enough water to fill 461,000 Olympic swimming pools
- waste equivalent to the weight of 290,000 Boeing 747 airplanes
- the acidification potential of 292,000 railcars of coal



Life Cycle Impacts of Plastic Packaging Compared to Substitutes In the United States and Canada: Theoretical Substitution Analysis, American Chemistry Council 2018 Impact of Plastics Packaging on Life Cycle Energy Consumption & Greenhouse Gas Emissions in the United States and Canada Substitution Analysis, Franklin Associates 2014



# Plastic

# Paper/cardboard

# Steel

# Aluminium









# WASTE

1000





#### **Municipal solid waste generation**

Plastics have massively reduced waste

"...plastics increased by nearly 84 times from 1960 to 2013 while total MSW increased only 2.9 times. The increase in plastic waste generation coincides with a decrease in glass and metal..."\*



# \*Impact of Plastics Packaging on Life Cycle Energy Consumption & Greenhouse Gas Emissions in the United States and Canada Substitution Analysis, Franklin Associates 2014

## **Removing plastics increases waste**

1lb of plastic requires 3-4lb of replacement material



#### Plastic waste generation, 2010



Total plastic waste generation by country, measured in tonnes per year. This measures total plastic waste generation prior to management and therefore does not represent the quantity of plastic at risk of polluting waterways, rivers and the ocean environment. High-income countries typically have well-managed waste streams and therefore low levels of plastic pollution to external environments.



Source: OWID based on Jambeck et al. (2015) & World Bank

Hannah Ritchie and Max Roser (2019) - "Plastic Pollution" - Published online at OurWorldInData.org Retrieved from: 'https://ourworldindata.org/plastic-pollution'

#### Share of plastic waste that is inadequately managed, 2010

Share of total plastic waste that is inadequately managed. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Inadequately managed waste has high risk of polluting rivers and oceans. This does not include 'littered' plastic waste, which is approximately 2% of total waste (including high-income countries).

Our World in Data



Source: Jambeck et al. (2015)

Hannah Ritchie and Max Roser (2019) - "Plastic Pollution" - Published online at OurWorldInData.org Retrieved from: 'https://ourworldindata.org/plastic-pollution'











# Plastic bank notes & litter

- Produced for decades
- ✤ 8 billion per year printed
- One per person on the planet made every year
- How many do you see on the street?
- How many do you see on the beach?
- Small, easily lost plastic and yet none becomes litter!
- People only litter when the object has no value
- That is why deposit schemes work so well









# OCEAN LITTER & MICROPLASTICS





#### **Gyre plastic**

Plastic concentration is 0.5kg per km<sup>2</sup> or 2lb per mile<sup>2</sup>



A. Cózar et al., Plastic Accumulation in the Mediterranean Sea, PLOS ONE | DOI:10.1371/journal.pone.0121762 April 1, 2015 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0121762

# Gyres

- Monitored for decades
- Claimed to be huge floating islands but...
- Gyres ~500g plastic per km<sup>2</sup>
- Which is 2lb per mile<sup>2</sup>
- Or less than 1 game die per Olympic sized pool
- Not detectable by sailing or swimming through it
- Average is 1 piece plastic per 130 bathtubs of water
- A severely exaggerated problem!
- Not a "patch" or "soup"

A. Cózar et al., Plastic Accumulation in the Mediterranean Sea, PLOS ONE | DOI:10.1371/journal.pone.0121762 April 1, 2015 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0121762





#### More BS! (bad science)

A comparison of actual microplastics and those used in studies

Material	Correct Material?	Correct Color?	Correct Size?	Correct Amount?
PE & PP Microplastic				
X-linked PS Particles	*	*	*	*

Studies usually use 100 to 10 million times higher concentration of particles than actually found in the ocean

- Studies usually use particles far smaller than found in the ocean meaning much higher surface area
- \* Studies often use PS particles that are chemically modified with amines etc. and have a surface charge
- Cross-linked PS is unlike PS in the ocean and also contains divinyl benzene residue (toxic)
- Lab synthesized PS nanoparticles are fluorescent and coloured red or green for biology experiments

# DEGRADATION





"This study examined biodegradable, oxo-biodegradable, compostable, and high-density polyethylene (i.e., a conventional plastic carrier bag) materials over a 3 year period. These materials were exposed in three natural environments; openair, buried in soil, and submersed in seawater..."



"After 9 months exposure in the open-air, all bag materials had disintegrated into fragments." The authors went on to conclude that oxo-biodegradable or biodegradable formulations do not help marine litter

Environmental Deterioration of Biodegradable, Oxo-biodegradable, Compostable, and Conventional Plastic Carrier Bags in the Sea, Soil, and Open-Air Over a 3-Year Period, I. E. Napper & R. C. Thompson, (2019) DOI: 10.1021/acs.est.8b06984

#### **Degradation rates**

#### A comparison of synthetic and natural materials

Material	Degrades in Soil?	Degrades in Landfill?	Degradation releases CO <sub>2</sub> & methane?	Green According to LCA?
PE or PP Film	Yes 1-3 years	No >100 years	Yes	Yes
Paper	Yes 1-3 years	No >100 years	Yes	No: Worse than PE & PP
PLA or PHB Bioplastic Film	Yes 1-3 years	No >100 years	Yes	No: worse than PE and PP
Leaves*, carrots, steak	Yes 1-3 years	No >100 years	Yes	Not applicable

\*A. M. Mohamed et al., Leaf Litter Decomposition and Mitigation of CO<sub>2</sub> Emissions in Cocoa Ecosystems DOI: 10.5772/intechopen.86520

# DECEPTION & GREED





#### Greenpeace admits its attacks on forest products giant were 'nonverifiable statements of subjective opinion'

Now Greenpeace says it never intended people to take its words about Resolute's logging practices as literal truth

#### **Greenpeace Kicked Out of India**

Ø NOVEMBER 06, 2015



#### Canada Leaves Greenpeace Red-Faced

#### Greenpeace denies science as it denigrates Plastics Industry Association

by: Clare Goldsberry in Sustainability, Materials, Medical on October 21, 2019

# **BREAKING:** Greenpeace co-founder reports Greenpeace to the FBI under RICO and wire-fraud statutes

**Technology & Science** 

#### Greenpeace loses charitable status

#### Kevin Libin: Environmentalists admit you shouldn't believe what they say — but they want your money anyway

Kevin Libin: Greenpeace's admissions in a recent lawsuit make it clear that environmentalists will spout baloney to make money in ways that no major company would dare

# Conclusions...

Plastics PE, PP & PET are greenest

Replacing them does tremendous damage (CO<sub>2</sub>, energy, waste, water)

Litter is due to bad human behaviour not due to materials or companies

Ocean plastic comes from 10 rivers in Africa / Asia & fishing boats

Certain green groups and companies are doing more harm than good

Use less material, reuse, dispose properly and recycle more

Prefer the greenest material and then recycle it



# You can be for the environment... or against plastics – but not both!

# **Questions?**



#### www.plasticsparadox.com



FACTS FOR A BRIGHTER FUTURE

F PI



After reading the flastics raradox you will be avie to m wise choices that help, rather than harm the environment.

green when in fact, they are usually the greenest choice. We are told that plastics create a waste problem when the science shows tole that plastics cleate a waste problem when the science shows that plastics have substantially reduced waste production. Everything you believe now is a lie and we are making policies that Everything you believe now is a lie and we are making policies that harm the environment because they are based on bad information. After reading The Plastics Paradox you will be able to make

science surrounding all aspects of plastics and the environmer Based on over 400 scientific articles, the book dispels the myths that the public believe today. We are told that plastics are not

The Plastics Paradox is the first and only book to reveal th

# **SUMMARY**

According to the best scientific studies, plastics are usually the greenest option. They are better for the environment than metal, glass, cotton and usually paper.

Studies show that PET is far greener than aluminium cans or glass bottles, saving energy, carbon dioxide and waste.

There are ocean areas called gyres where plastics concentrate but levels are so low, you can't even tell if you are sailing or swimming there.

Biodegradable materials are often less green than plastics and when they degrade, they release large amounts of carbon dioxide.

Plastics degrade at about the same speed as other organic matter like leaves and trees.

There will not be more plastic than fish in the sea by 2050.

Plastics are just 11-13% of all waste and they are proven to reduce overall waste creation. In fact, replacing plastics requires 3-4x more of the replacement material.

The scientific evidence shows that people are the cause of litter. To stop litter, we need to encourage better human behaviour.

Changing to paper bags means cutting down millions more trees per year, more carbon dioxide released and generating up to 10x more waste.

Plastics production consumes only 4-5% of oil and they save more than that in use.

No, the USA does not consume 500 million straws per day.

#### **Phantom Plastics®**

- ✤ 30 years innovating including time at Electrolux (Frigidaire) & BASF
- C-level Management, R&D, Marketing, Product Development and Sales
- Expert in plastics, filled plastics, mineral fillers, specialty chemicals, materials and consultant to the Fortune 500 including P&G, Total, Disney, Apple, HP, Exxon, Chemtura, iRobot, Lord Corporation, Ascend, ICL and more
- Serial innovator with over 30 registered inventions, 14 patents & 6 Innocentive® open innovation cash prizes & ranked in top 0.01% of registered innovators
- ✤ 2 Books, ~40 articles, 12 book chapters, ~40 presentations, ~50 workshops
- Fellow of the Royal Society of Chemistry & Chartered Chemist
- Awards for speaking, Frost & Sullivan Award, R&D 100 Award
- Voted #1 plastics expert world-wide out of over 14 000 peers





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