

Phantom Plastics®



The Great Plastics Distraction 3.0

How environmental groups have misled us

The Plastics Paradox

Facts for a Brighter Future

Motivations

Plastic manufacturers want to sell their products

NGOs want donations

University scientists want acclaim and funding

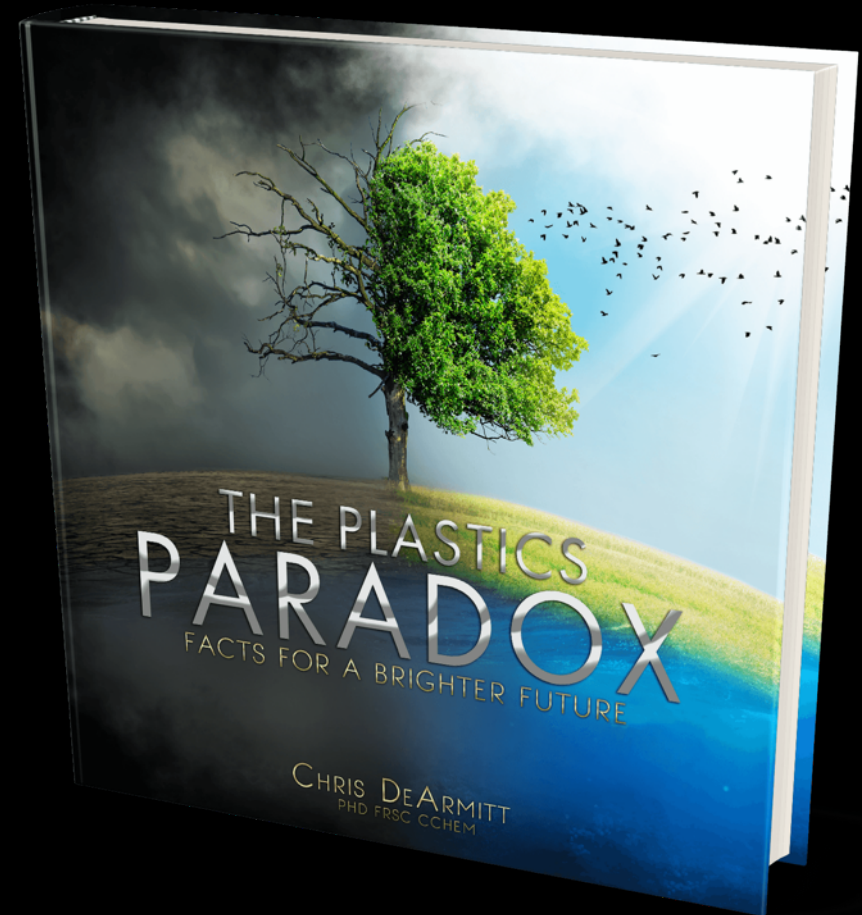
The media want to sell stories

Shops & supermarkets follow customer demand

Politicians feel compelled to do what voters want

The public want to feel good and look good

Need solid information to make wise choices



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Short Biography

Chris is considered one of the top plastic materials experts and problem-solvers in the world, which is why companies like HP, Apple, P&G, iRobot, Eaton, Total, and Disney come to him for help.

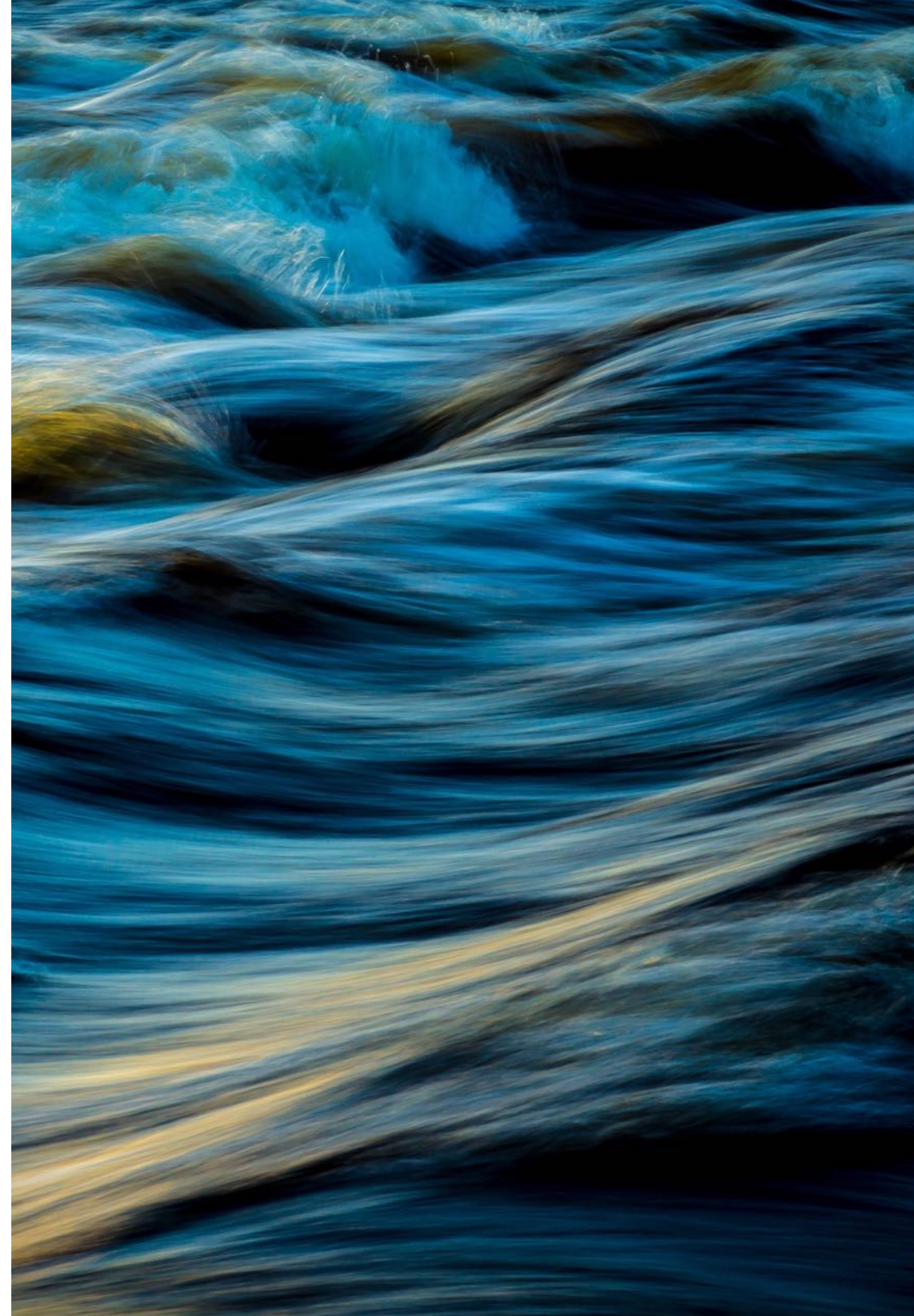
A deep understanding of materials combined with high creativity allows Chris to quickly solve even the toughest challenges. As one example, he solved a serious production issue that had plagued BASF for 30 years and cost them millions.

He has also received six open innovation cash prizes, placing him among the top 0.01% of innovators. In 2016, he published the book *Innovation Abyss* which reveals the true reasons for innovation failure and the proven path to success.

In 2018, Chris was featured on CBS's 60 Minutes with Scott Pelley as an expert witness in a class-action lawsuit related to Marlex mesh plastic implants. He helped thousands of women get settlements. Later television appearances include Sky News and the BBC as well as assorted radio and internet media interviews.

In 2020, Dr. DeArmitt published *The Plastics Paradox*, the first comprehensive, scientific overview of plastics materials and the environment covering all topics including waste, litter, microplastics, degradation, ocean plastics and more.

Chris has a multitude of granted patents as well as numerous articles, book chapters, encyclopedia chapters, and conference presentations to his name. He is an award-winning keynote speaker on plastic materials, environmental effects of plastics, and innovation-related topics.



Fact or Fiction?

“The data comprise ~126,000 stories tweeted by ~3 million people more than 4.5 million times.”

“Falsehood diffused significantly farther, faster, deeper, and more broadly than the truth in all categories of information...”

“When we estimated a model of the likelihood of retweeting, we found that falsehoods were 70% more likely to be retweeted than the truth”

The majority of information we receive through social media is false



The Illusory Truth Effect

"In line with previous work, we found that individuals tend to believe repeated information more compared to new information."

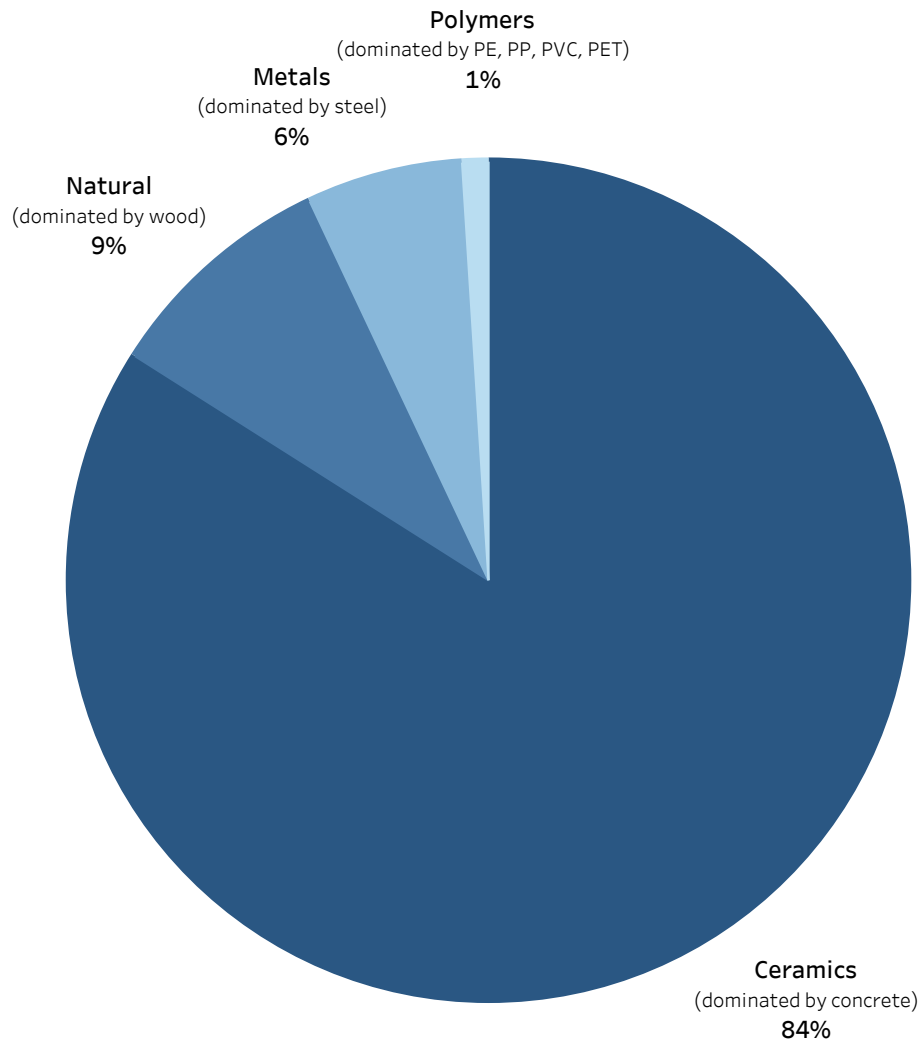
"Across seven studies, this tendency was not reliably and substantially related to cognitive ability..."

People believe lies if they are repeated often enough

J. De keersmaecker et al., Investigating the robustness of the illusory truth effect across individual differences in cognitive ability, need for cognitive closure, and cognitive style, Personality and Social Psychology Bulletin 46 (2) pp. 204-215 June 2019



Material Use



Global consumption of materials is 90 Billion metric tons per year

Global plastics consumption is 370 Million metric tons per year

Assessing Global Resource Use: A systems approach to resource efficiency and pollution reduction, Stefan Bringezu et al., UNEP 2017

Global plastic production 1950-2019, Published by M. Garside, Statista, Dec 11, 2020

Plastics represent just ~0.4% of the materials we use

Waste Creation

Plastics make up ~13% of household waste

Solid municipal waste is only 3% of all waste

Industrial waste makes up the remaining 97%

Plastics represent just ~0.3% of the waste we create

Garbage Land: On the Secret Trail of Trash, Elizabeth Royte, Little, Brown and Company 2016

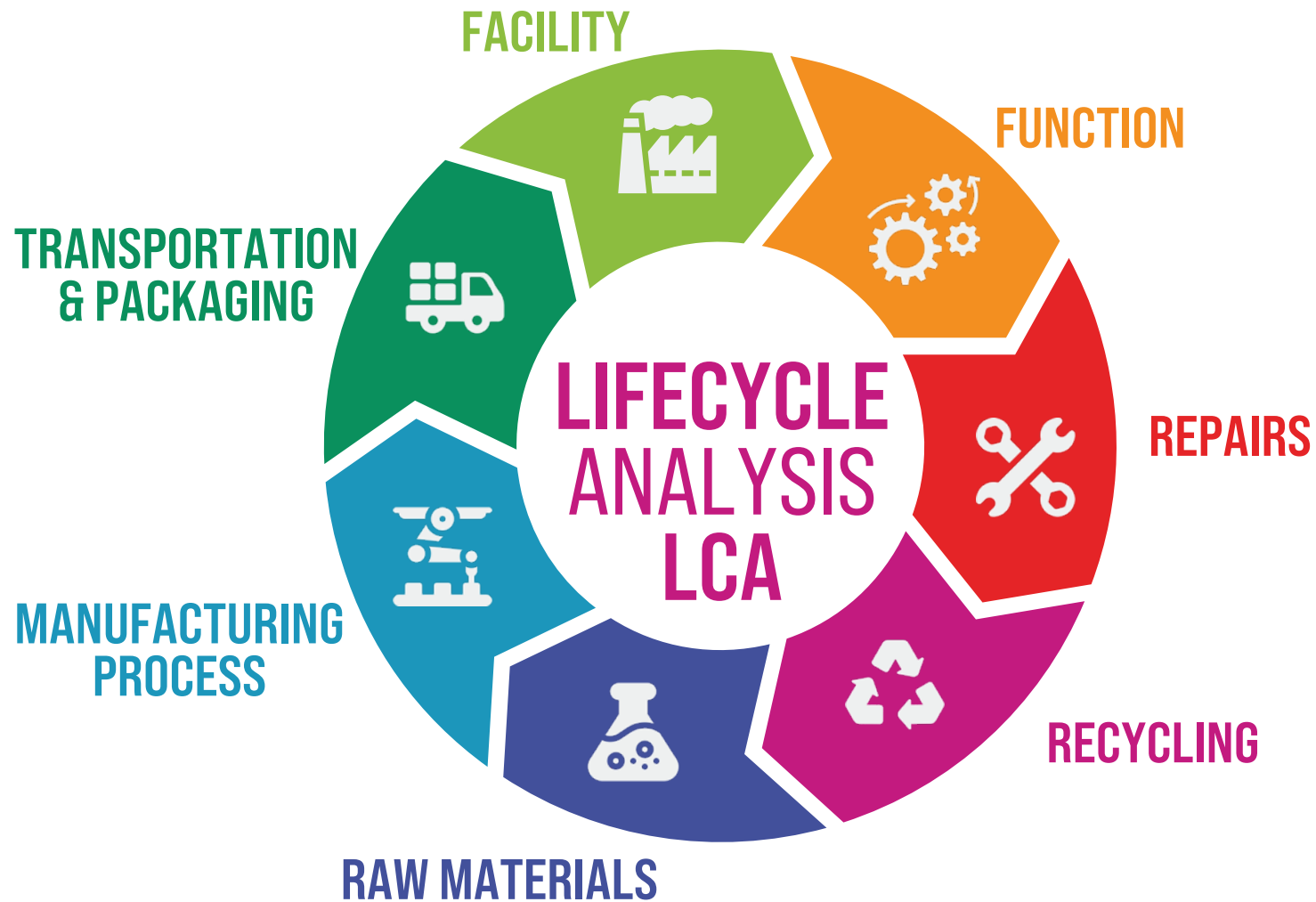
US Congress, Office of Technology Assessment. (1992). Managing Industrial Solid Wastes from Manufacturing, Mining, Oil, and Gas Production, and Utility Coal Combustion, OTA Report No. OTA-BP-O-82. Washington, D.C.: US Government Printing Office

Human Activity and the Environment, Minister of Industry, Government of Canada, Statistics Canada (2012)

Municipal versus Industrial Waste: Questioning the 3-97 ratio, M. Liboiron, Discard Studies 2016



What is Green?



LCA is the only way to know what is green

What is Green?

 **WOOD**

 **PLASTIC**

 **PAPER/CARDBOARD**

 **STEEL**

 **ALUMINIUM**

 **GLASS**



LCA shows that plastics are usually the greenest choice

Drink Container LCA

Container Type and Material	Container Mass (grams)	Carbon Footprint per Container (kg/kg)	Carbon Footprint per Fluid Packaged (g/L)	Recycling Rate (Percent)
500ml Cardboard PE Al PP	22	3.55	78	0
1L HDPE Bottle	30	2.8	84	8
500ml PET Bottle	25	2.7	135	21
440ml Steel Can	45	2.3	235	42
750ml Glass Bottle	325	0.76	247	24
440ml Aluminium Can	20	12	545	43

Materials and the Environment: Eco-Informed Material Choice 3rd Edition, Michael F. Ashby, Butterworth-Heinemann / Elsevier, Oxford, page 232, UK 2021

Metal and Glass Cause Most Harm

26 Studies from 8 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.”

Plastics & CO₂

“In 2007 the estimated use benefits were 5-9 times higher than the emissions from the production and recovery phases.”

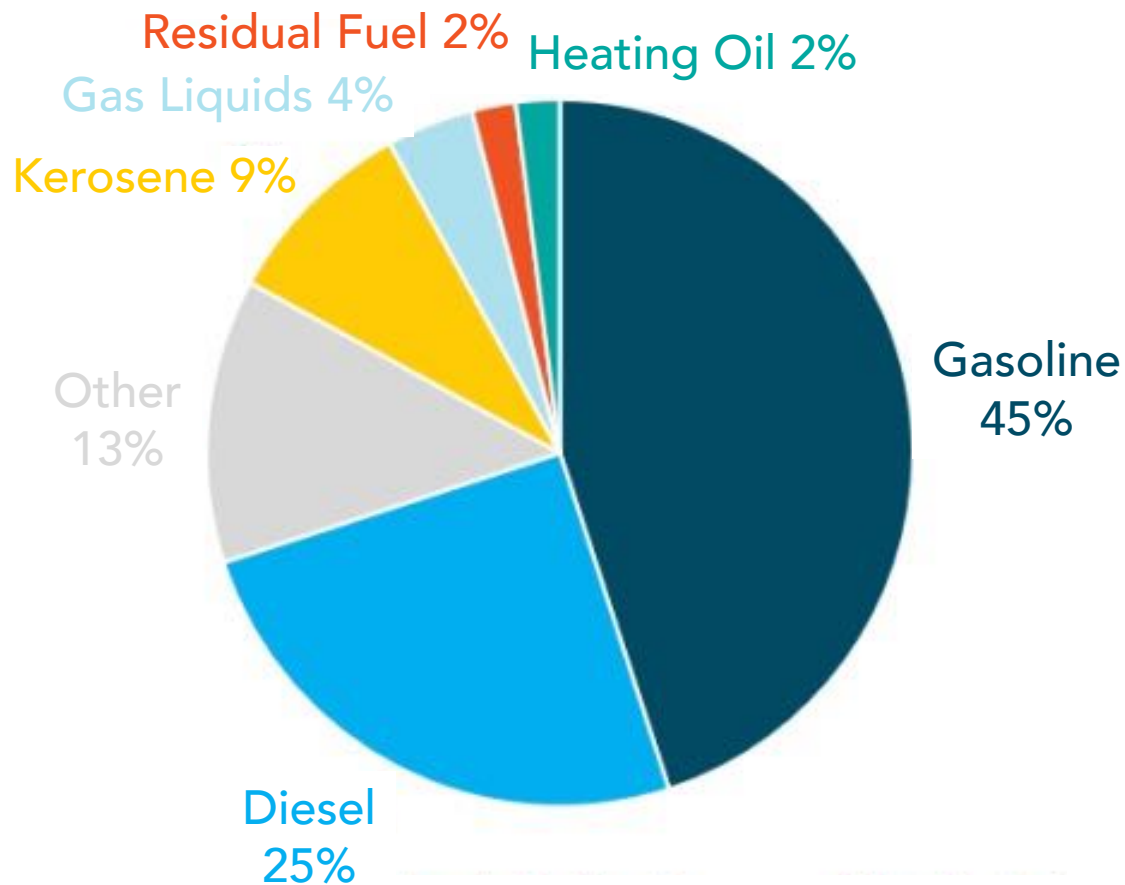
“In 2020 the estimated use-benefits could be 9-15 times higher than the forecast emissions.”

“Substitution of plastic products by other materials will in most cases increase the consumption of energy and the emission of greenhouse gases.”

**Plastics reduce energy, fossil fuel
and carbon dioxide**



Oil Use



45% Gasoline – BURNT
25% Ultra-Low Sulfur Diesel – BURNT
9% Kerosine / Jet Fuel – BURNT
2% Heating Oil – BURNT
2% Residual Fuel – BURNT

~5% Plastics – USED

Plastics use just 5% of oil
Plastics save more than 5% oil
Can be burnt later for electricity

Plastics & Oil

Material	1950 Car (kg) 15mpg	1990 Car (kg) 27mpg
Iron	220	207
Steel	1290	793
Aluminium	0	68
Copper	25	22
Lead	23	15
Zinc	25	10
Plastics	0	101
Rubber	85	61
Glass	54	38
Fluids	96	81
Other	83	38
Total	1901	1434

Materials and the Environment: Eco-Informed Material Choice 3rd Edition, Michael F. Ashby, Butterworth-Heinemann / Elsevier, Oxford, page 54, UK 2021

Plastics save huge amounts of oil



Turtles

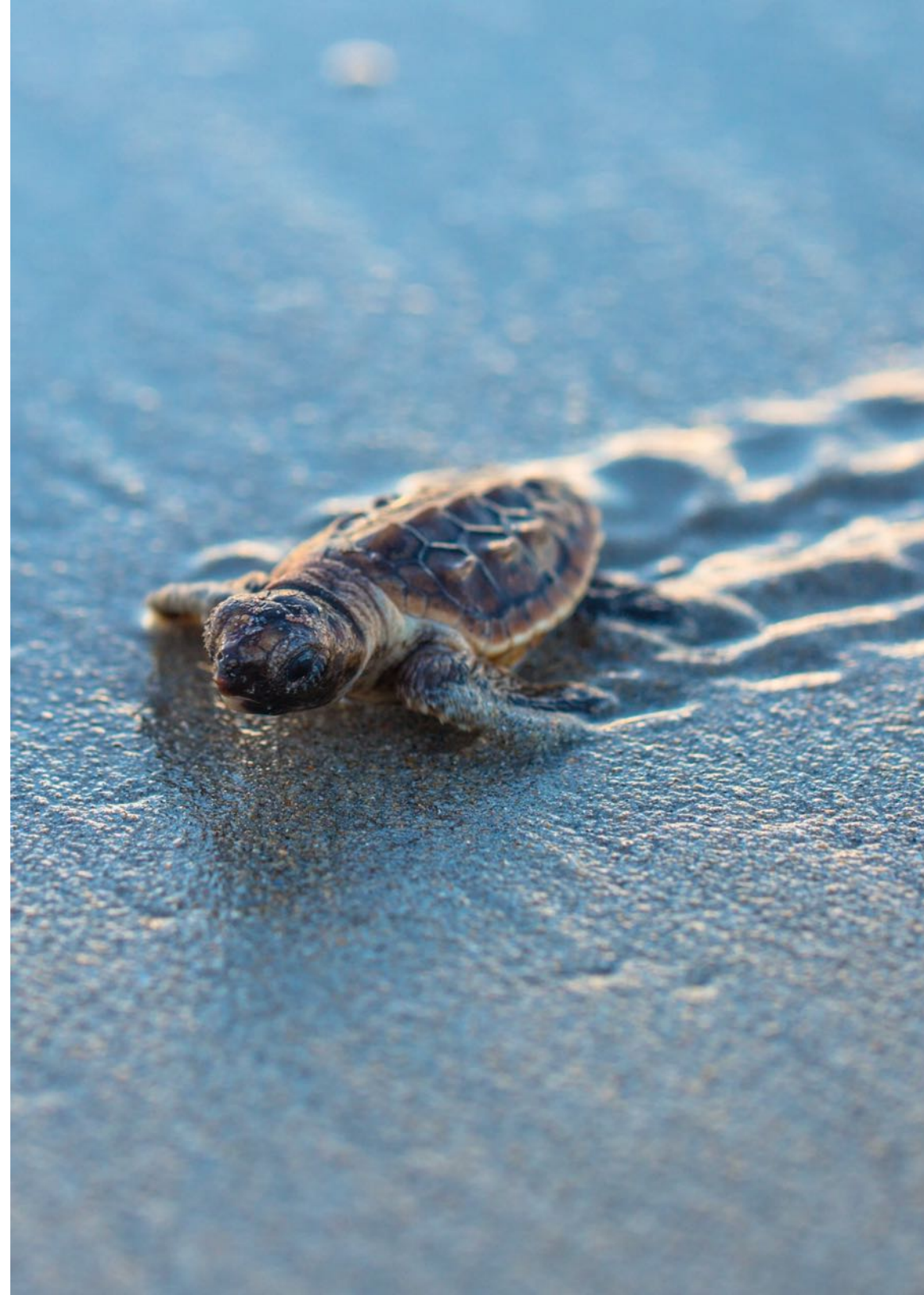
Here are the leading causes of Loggerhead Turtle mortality:

Source of Mortality Caused by Humans	Mortalities per Year
Shrimp trawling	5,000 – 50,000
Fishery (trawl & release, passive gear, net entanglement)	500 – 5000
Collisions with boats	50 – 500
Dredging	5 – 50
Other	20 – 200

National Research Council. 1990. Decline of the Sea Turtles: Causes and Prevention. Washington, DC: The National Academies Press. <https://doi.org/10.17226/1536>

Allen M. Foley et al., Characterizing Watercraft-Related Mortality of Sea Turtles in Florida, The Journal of Wildlife Management, 83 (5):1057–1072; 2019; DOI: 10.1002/jwmg.21665

Plastics are not a significant threat to turtles



Whales

Here are the results from a study conducted from 1970 – 2009 covering 1762 mortalities. Cause of death could be determined for 43% of the whales and of those, 67% were caused by humans:

Source of Mortality from All Causes	Mortalities per Year
Entanglement in fishing gear	323
Natural causes	248
Vessel strikes	171

J. M. Van der Hoop et al., Assessment of Management to Mitigate Anthropogenic Effects on Large Whales, *Conservation Biology*, 27 (1), 121–133, 2012

R. Knowlton, S. M. Kraus, Mortality and serious injury of northern right whales (*Eubalaena glacialis*) in the western North Atlantic Ocean, *J. Cetacean Res. Manage.*, 2, 193-208 2001

C. Kemper et al., Southern right whale (*Eubalaena australis*) mortalities and human interactions in Australia, 1950-2006, *J. Cetacean Res. Manage.*, 10 (1), 1-8 2008

J. J. Meager, Marine wildlife stranding and mortality database annual report 2012. II. Cetacean and Pinniped. Conservation Technical and Data Report, 2:1-38 2013



The words “plastic” or “bag” did not appear

Plastics are not a threat to whales

Birds

Source of Mortality Caused by Humans	Mortalities per Year
Buildings	550,000,000
Power lines	130,000,000
Cats	100,000,000
Automobiles	80,000,000
Pesticides	67,000,000
Communication towers	4,500,000
Wind turbines	28,500
Airplanes	25,000

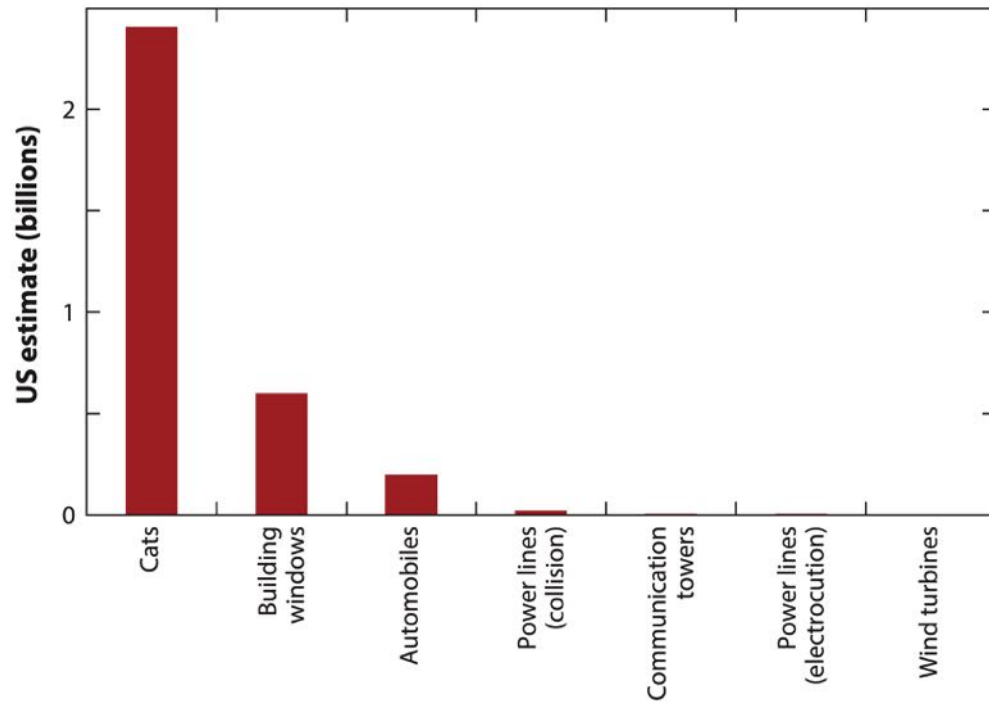
W. P. Erikson et al., A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions, USDA Forest Service Gen. Tech. Rep. PSW-GTR-191 p1029-1024 2005

The words "plastic" and "bag" did not appear

Plastics are not a threat to birds



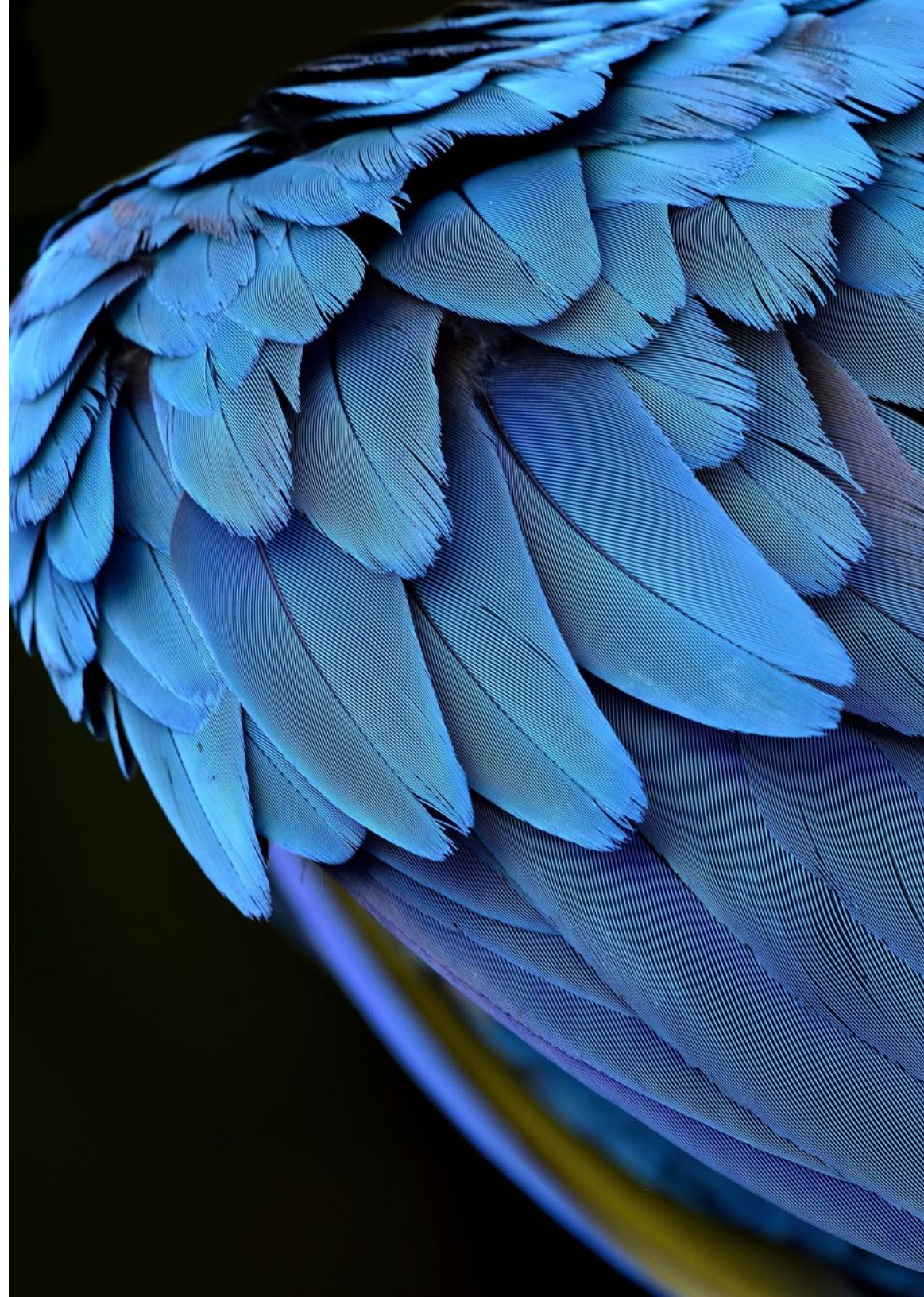
Birds



S. R. Loss, T. Will & P. P. Marra, Direct Mortality of Birds from Anthropogenic Causes, *Annu. Rev. Ecol. Evol. Syst.* **46** (99–120) 2015

The words "plastic" and "bag" did not appear

Plastics are not a threat to birds



The Oceans

Claimed that there will be more plastic than fish in the sea by 2050 – but that's soundly disproven

Previous Estimate ~10 Million tons per year

Latest Estimate 6000 tons per year

Plastic entering the oceans from rivers is 1000x less than previously thought

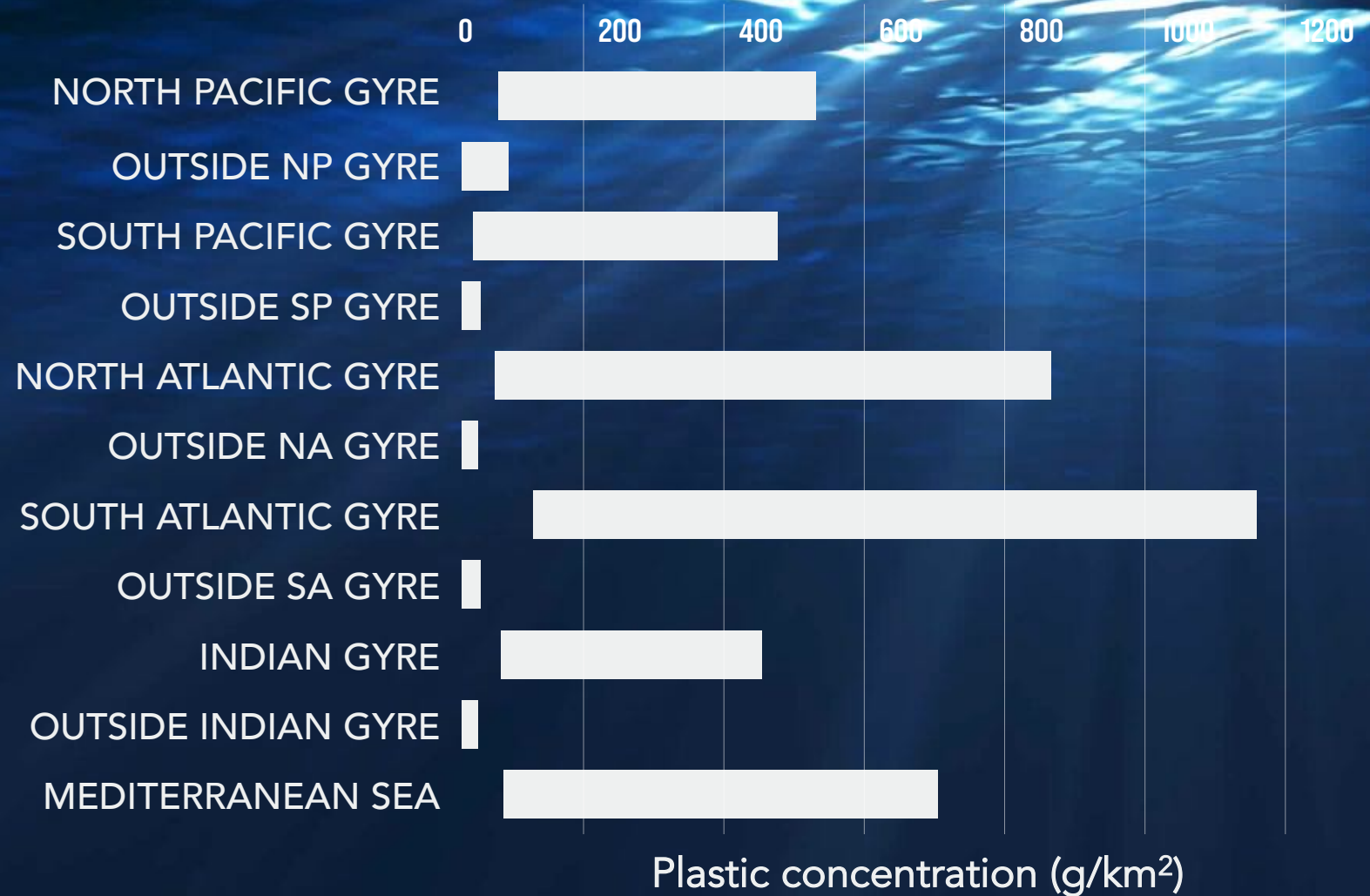
W. Ludwig and J.-L. Probst, River sediment discharge to the oceans: Present-day controls and global budgets, *American Journal of Science*, 298 pp. 265-295 April 1998

L. Weiss et al., The missing ocean plastic sink: Gone with the rivers, *Science*, 373 (6550), 107-111 2021

Note: slide updated because previous estimates of plastics are now known to be 1000 lower than previously believed



OCEAN PLASTIC



No floating islands – at most 1 game die (5g) per Olympic Pool of water

Plastic Prejudice

- ❖ 500-year-old wooden ship Mary Rose, Vasa
- ❖ 2000-year-old metal coins Roman
- ❖ 2500-year-old parchment Dead Sea Scrolls
- ❖ 20,000-year-old clay vase in China

If an object is made of metal, glass, wood, cloth, clay or paper we celebrate finding it, put it in a museum and charge money to see it.

And yet we claim that plastics are despicable materials because they don't degrade - even though that's untrue.

Plastics suffer from unjust discrimination



Roman emperor Maximinus among others 200AD
Copper and zinc plus lead and tin impurities

Dust Dangers

Solids fragment into microparticles as they age and degrade e.g. metals, sand, rock, glass, leaves

The same applies to plastics, so why the irrational fear of plastic microparticles?

Inorganic dust is enriched in heavy metals like lead and cadmium, which are known toxins plus very large amounts of quartz (10-50%) that is known to cause cancer when inhaled.

“Comparing our findings with the intake of other particles, MP mass intake rates are insignificant, as they make up for only 0.001% of these particles.”

Microplastics are 0.03% of dust in the air

J. O. Anderson et al., Clearing the Air: A Review of the Effects of Particulate Matter Air Pollution on Human Health, J. Med. Toxicol., 8, pp. 166-175 (2012)

R. C. Heindel et al., Atmospheric Dust Deposition Varies by Season and Elevation in the Colorado Front Range, USA, JGR Earth Surface, 125(5), April 2020

Silica Dust, Crystalline, in the Form of Quartz or Cristobalite, IARC Monographs 100C



Microparticle Toxicity

Material	Cell Death (%)	Safety Rating
Polyethylene PE	<1	1
Polypropylene PP	<1	1
Polyester PET	<1	1
PVC	<1	1
Alumina	<1	1
Aragonite	<2	1
Kaolin clay	<2	1
Talc	<1	1
Carbon	<1	1
Polyurethane	<10	2
Amorphous Silica	<10	2
Asbestos	>10	3

J. A. Styles & J. Wilson, Comparison between in vitro toxicity of polymer and mineral dusts and their fibrogenicity, *Ann. Occup. Hyg.*, Nov;16(3), 241-50 (1973).

Common plastic microparticles are safe



Eating Microplastic

WWF-funded study says we eat up to a credit card of plastic per week i.e. 5g

Newer **independent** study says we ingest 5g of microplastic every 27 000 years

WWF-funded study estimates we ingest 14–714 mg per day of microplastic

The newer study estimates we ingest 0.0005 mg per day of microplastic

Ingestion of microplastics is not significant

K. D. Cox et al., Human Consumption of Microplastics, *Environ. Sci. Technol.*, 53, 12, 7068–7074 2019

Nur Hazimah Mohamed Nor et al., Lifetime Accumulation of Microplastic in Children and Adults, *Environ. Sci. Technol.*, 55, 8, 5084–5096 2021



Microplastics in fruit & veg

“Apples had one of the highest microplastic counts in fruit, with an average of 195,500 plastic particles per gram, while pears averaged around 189,500 plastic particles per gram. Broccoli and carrots were shown to be the most contaminated vegetables, averaging more than 100,000 plastic particles per gram.”

Greenpeace East Asia



Shockingly, if you read the actual scientific paper they did not detect plastic at all.

They assumed there was plastic without evidence.

This travesty has been reported to the publisher.

Bad science & scare tactics are misleading us

G. O. Conti et al., Micro- and nano-plastics in edible fruit and vegetables. The first diet risks assessment for the general population, Environmental Research 187, 109677 2020

3 Everyday Foods that Contain Microplastics, Greenpeace East Asia, July 21st 2020
www.greenpeace.org/eastasia/blog/6016/3-everyday-foods-that-contain-microplastics/

New Studies: Microplastics Found in Fruit and Veg, Plastic Soup Foundation June 2020
www.plasticsoupfoundation.org/en/2020/06/new-studies-microplastics-found-in-fruit-and-veg/

Microplastics: Is there plastic in our fruit and veg? BBC June 2020
www.bbc.co.uk/newsround/53195056



Misleading Media

“The results show that most scientific studies (67%) frame microplastics risks as hypothetical or uncertain, while 24% present them as established. In contrast, most media articles reporting on microplastic impacts (93%) imply that risks of microplastics exist and harmful consequences are highly probable.”

Some scientists and the media exaggerate and distort the truth for the sake of attention and money



Reason for Litter

“A clear majority (76.7%) of the 219 smokers observed littered their cigarette butts.”

“Overall, most smokers (73.5%) did not extinguish their butts and some placed lit butts in bins (constituting a risk of bin fires).”

“The context for this littering was a high density of rubbish bins on this circuit with a mean of 3.5 bins being in view and with a bin every 24 m on average.”

Litterers cause litter

Blaming companies or materials is naïve, unjust and counterproductive



Reason for Litter

“Out of 240 interviewed children, 41.7% admitted glass littering.”

“140 (58.3%) of the children interviewed had been injured by broken glass at least once while walking outdoors and 95 of the children had received professional medical care for the lacerations.”

Litterers cause litter

Blaming companies or materials is naïve, unjust and counterproductive



EPR & Misplaced Blame

>50% of car fatalities caused by top 10 car manufacturers

>90% of firearm deaths are caused by 10 gun manufacturers

100% of horse riding accident are caused by God (maker of horses)

>85% of beverage litter caused by 4 largest soda companies

Either all of these statements are true, or none of them are.

Do we blame car companies for our accidents? Do we send them to jail?

Is it fair to blame beverage companies for drinks we buy and litter we create?

**Blaming the manufacturer makes no sense
but "environmental" groups make that claim
all the time**



NGO Scorecard

Topic	Science says problems are	NGOs prioritize	Correct advice from NGOs?
Materials	Concrete, wood, metals	Plastic	No
Waste	Manufacturing, mining, oil, gas	Plastic	No
Turtles	Trawling, fishing, boat strikes	Plastic	No
Whales	Fishing gear, vessel strikes	Plastic	No
Birds	Buildings, powerlines, cats	Plastic	No
Dust	Inorganic dust (quartz, Pb, Cd)	Plastic	No
Energy & CO ₂	Gold, platinum & palladium	Plastic	No
Grocery bags	Paper, cotton, bioplastic	Plastic	No

So-called "environmental" groups are either wildly incompetent or corrupt and are harming the environment with appallingly bad advice



Green-Fleeced

Greenpeace is a very successful business. Their business model can be summarized as follows:

- ❖ Invent an "environmental problem" which sounds somewhat plausible. Provide anecdotal evidence to support your claims, with emotionally powerful imagery.
- ❖ Invent a "simple solution" for the problem which sounds somewhat plausible and emotionally appealing, but is physically unlikely to ever be implemented.
- ❖ Pick an "enemy" and blame them for obstructing the implementation of the "solution". Imply that anybody who disagrees with you is probably working for this enemy.
- ❖ Dismiss any alternative "solutions" to your problem as "completely inadequate".

Certain NGOs are not helping

Analysis of Greenpeace's business model & philosophy



GREENPEACE wants a piece of your green

An independent report by Dr. Michael Connolly, Dr. Ronan Connolly, Dr. Willie Soon, Dr. Patrick Moore and Dr. Imelda Connolly (December 2018)

Green-Fleeced

Greenpeace's latest campaign on "the plastics crisis" is having the following effects:

- ❖ It is making people feel guilty and worried about a "crisis" which isn't actually real.
- ❖ It is prompting people, governments and businesses to implement radical reforms without thinking through the consequences.
- ❖ It is hampering efforts to evaluate and deal with the genuine "ocean plastic pollution" concern.
- ❖ It is generating increased annual turnover for Greenpeace.

Certain NGOs are not helping

Analysis of Greenpeace's business model & philosophy



GREENPEACE wants a piece of your green

An independent report by Dr. Michael Connolly, Dr. Ronan Connolly, Dr. Willie Soon, Dr. Patrick Moore and Dr. Imelda Connolly (December 2018)

Consequences

Climate > News

Supermarkets bringing in even more damaging packaging in rush to ditch plastic, study finds

Race to find alternatives leads to rise in items creating more greenhouse gases

Jane Dalton | Thursday 09 January 2020 07:38 | comments



So-called "environmental" groups mislead the public

Companies and politicians comply - thereby increasing harm

Greed and lies are increasing environmental damage

The Plastics Paradox

Facts for a Brighter Future

Evidence-based Solutions

Reduce, reuse and recycle materials, especially concrete, metal & wood

Reduce litter – education, massive fines and shaming

Reduce damage – select the greenest material for each application

Accurate information – the media should report truth, not trash

Plastics companies & OEMs should start defending the truth

Shops & supermarkets should do what is proven greenest

Politicians should prioritize planet over poll results

The public should focus on being good, rather than looking good

Please help me to spread the facts to replace fiction
Who do you know that can make a difference?

Q & A

Answers to common questions

Q. Should we get rid of plastics and are they bad for the environment? +

Q. Should we replace PET bottles with aluminum cans or glass bottles? +

Q. Are there huge floating islands of plastic in the ocean? +

Q. Should we switch to biodegradable materials? +

Q. Do plastics take 1000 years to degrade? +

Q. Will there be more plastic than fish in the sea by 2050? +

Q. Are the oil industry pushing plastics onto the market to save themselves from declining sales? +

Q. Are there 100,000 microplastic particles per gram of fruit and vegetables? +

Q. Should we use more metal & glass because they are recycled at a higher rate? +

Q. Is the Grand Canyon drowning in microplastic dust? +

Q. Are microplastics the only particles found in the placenta? +

Q. Is it true that Henderson Island is overwhelmed with plastic pollution? +

Q. Are PVA detergent pods a problem because they fail to biodegrade? +

Q. Should we replace plastics because they create a waste problem? +

Q. Should we ban plastics because they cause litter? +

Q. Do plastics items harm marine wildlife? +

Q. Should we ban plastic bags? +

Q. Do plastics consume huge amounts of fossil fuel? +

Q. Does the USA consume 500 million straws per day? +

Q. Is LEGO washing up on beaches really a problem? +

Q. Did a study find microplastics in human tissue? +

Q. Was a plastic straw pulled out of a sea turtle's nose?? +

Q. Do plastics increase carbon dioxide emissions? +

Q. Are the plastics we use releasing toxic chemicals? +

Q. Is it true that we eat a credit card's worth of plastic per week? +

Q. Are PFAS, so-called "forever chemicals" a real concern? +

QUESTIONS?



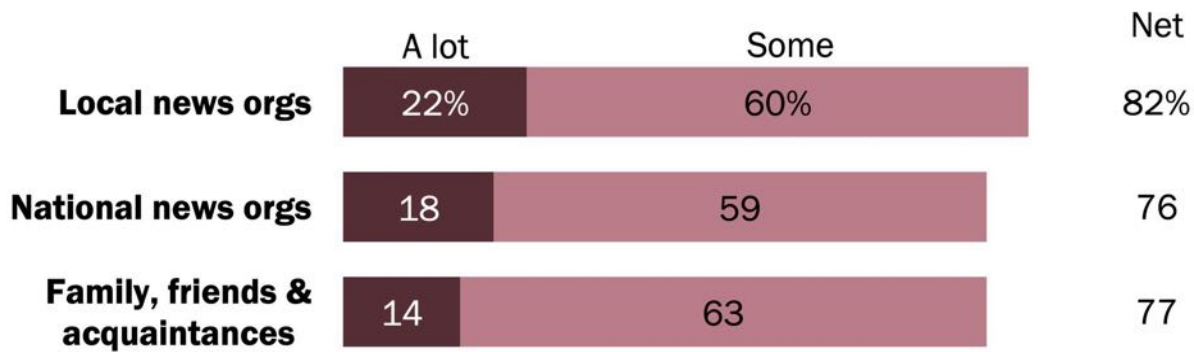


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Who to Trust?

% of U.S adults who trust the information they get from ...



But social media garners less trust than either

% of web-using U.S. adults who trust the information they get from ...



The Pew Research Center, July 2016 "The Modern News Consumer", A. Mitchell et al.

We don't trust normal or social media



Degradation

Paper degradation at room temperature is estimated to take 2700 years

The oldest paper document, The Missal of Silos, dates from before 1080AD

Paper is polymeric organic matter, just like plastic and degrades similarly

Paper degrades into microparticles, just like plastics and other solids do

Paper gives off carbon dioxide and methane in a landfill

Plastic degrades like other materials

P. Calvini and A. Gorassini, On the Rate of Paper Degradation, *Restaurator*, 27, 275-290, 2006

C. Crespo and V. Viñas, The Preservation and restoration of paper records and books: a RAMP study with guidelines, UNESCO PGI-84/WS/25 1984

Decomposition and carbon storage of selected paper products in laboratory-scale landfills, X. Wang et al., *Science of the Total Environment* 532, 70-79 2015

