Hidden Hazards

The Chemical Footprint of a Plastic Bottle

A presentation hosted by the Collaborative For Health and Environment on 8 June 2023

Mike Belliveau, President & Executive Director

SPECIAL THANK YOU TO:

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BEYOND Petrochemicals
PEOPLE OVER POLLUTION

and Bloomberg Philanthropies

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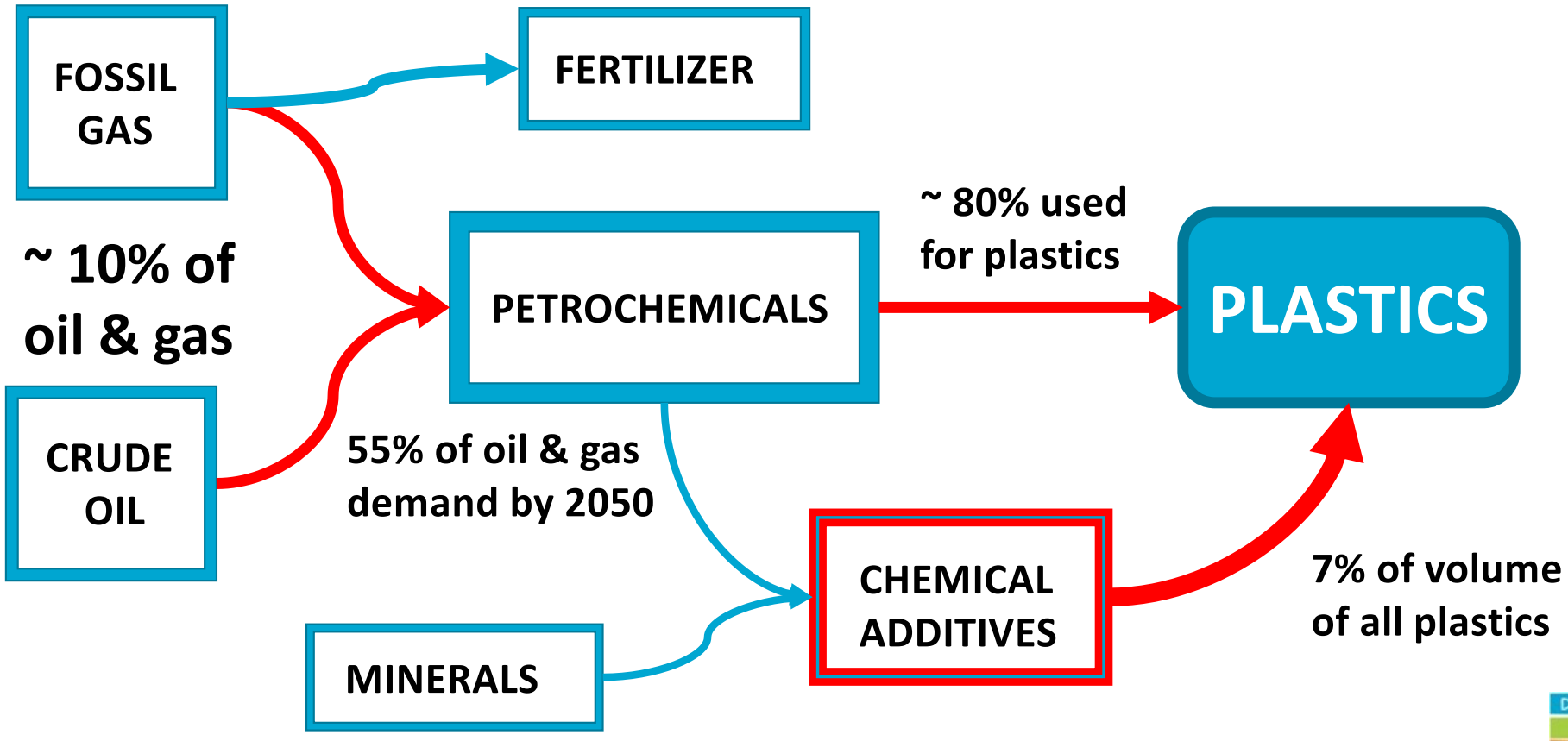
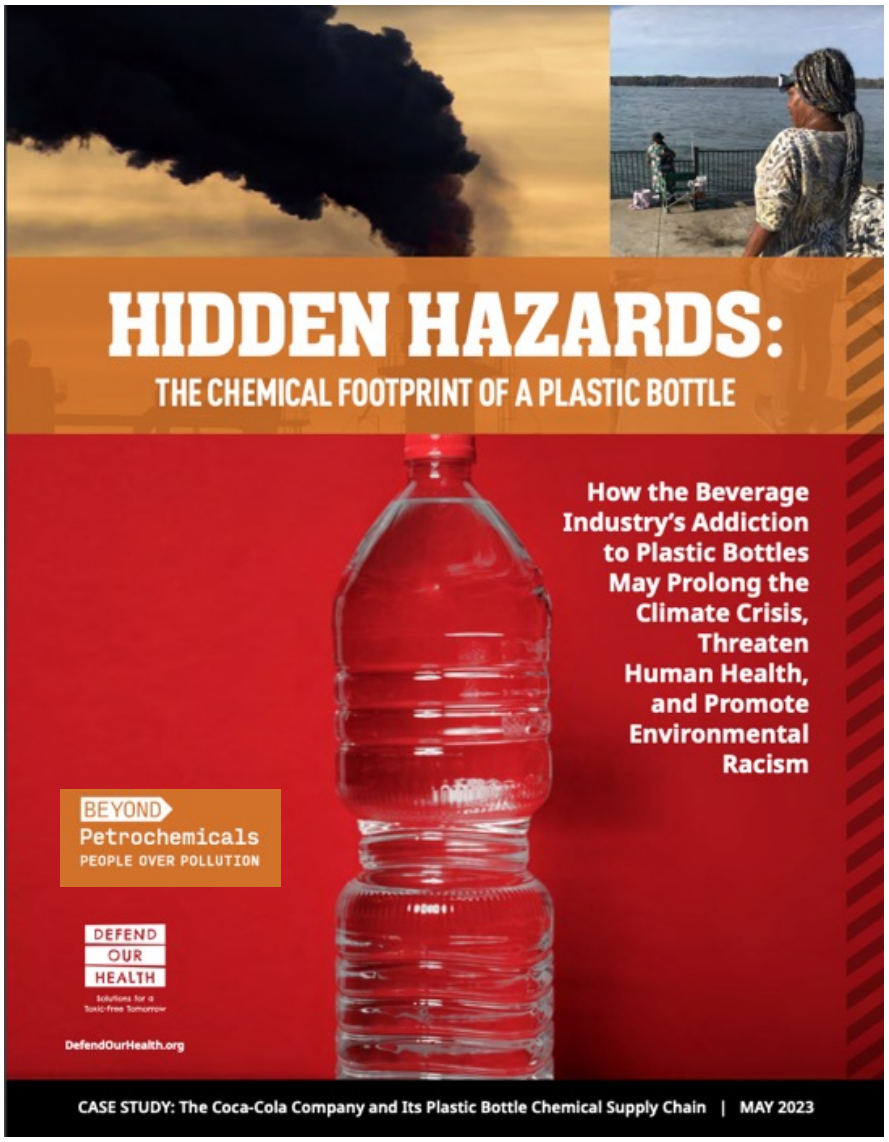
Petrochemical Plastics Drive Demand



Sources: Geyer et al. (2017) *Science Advances,* IEA (2018) The Future of Petrochemicals, IEA (2021) World Energy Outlook



Brands will be held increasingly accountable for all impacts across their plastics supply chain

- **Carbon Footprint**

  Scope 3 - Greenhouse Gas Protocol

- **Chemical Footprint**

  Chemical Footprint Project

- **Embedded Racism**

  EJScreen – Screening and Mapping Tool

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Chemical Watch by enhesa.

by Cailey Gleeson

US NGO calls for removal of cancer-causing chemicals from PET production

NEWS | 23 May 2023

Group urges beverage industry, EPA to address metals, 1,4 dioxane and other substances

FoodPrint.

by Jodi Helm
7 June 2023

A New Report Details the Climate, Health and Human Rights Impacts of a Plastic Bottle

https://foodprint.org/blog/impacts-of-a-plastic-bottle/

Grist

by Joseph Winters
23 May 2023

https://grist.org/accountability/plastic-bottles-harm-human-health-at-every-stage-of-their-life-cycle/

Plastic bottles harm human health at every stage of their life cycle

A new report says beverage companies like Coca-Cola must be "held accountable for the supply chain impacts of their plastics."

Soeren Stache / Picture Alliance via Getty Images

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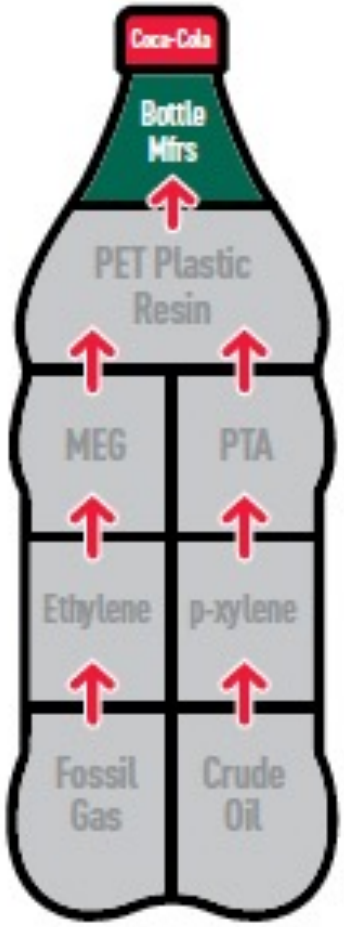
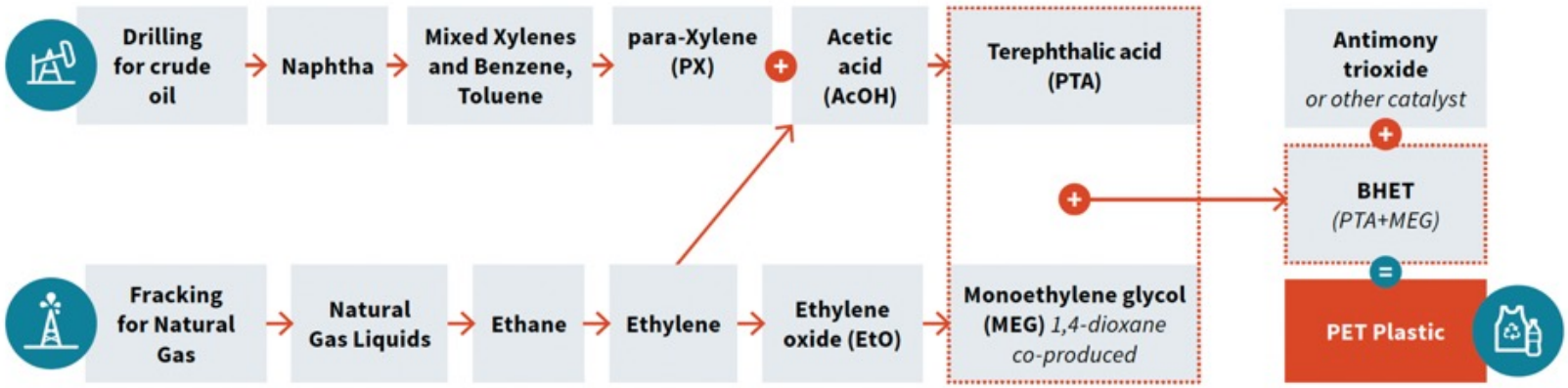


Know the Process Flow –
What are the steps in making PET plastic?



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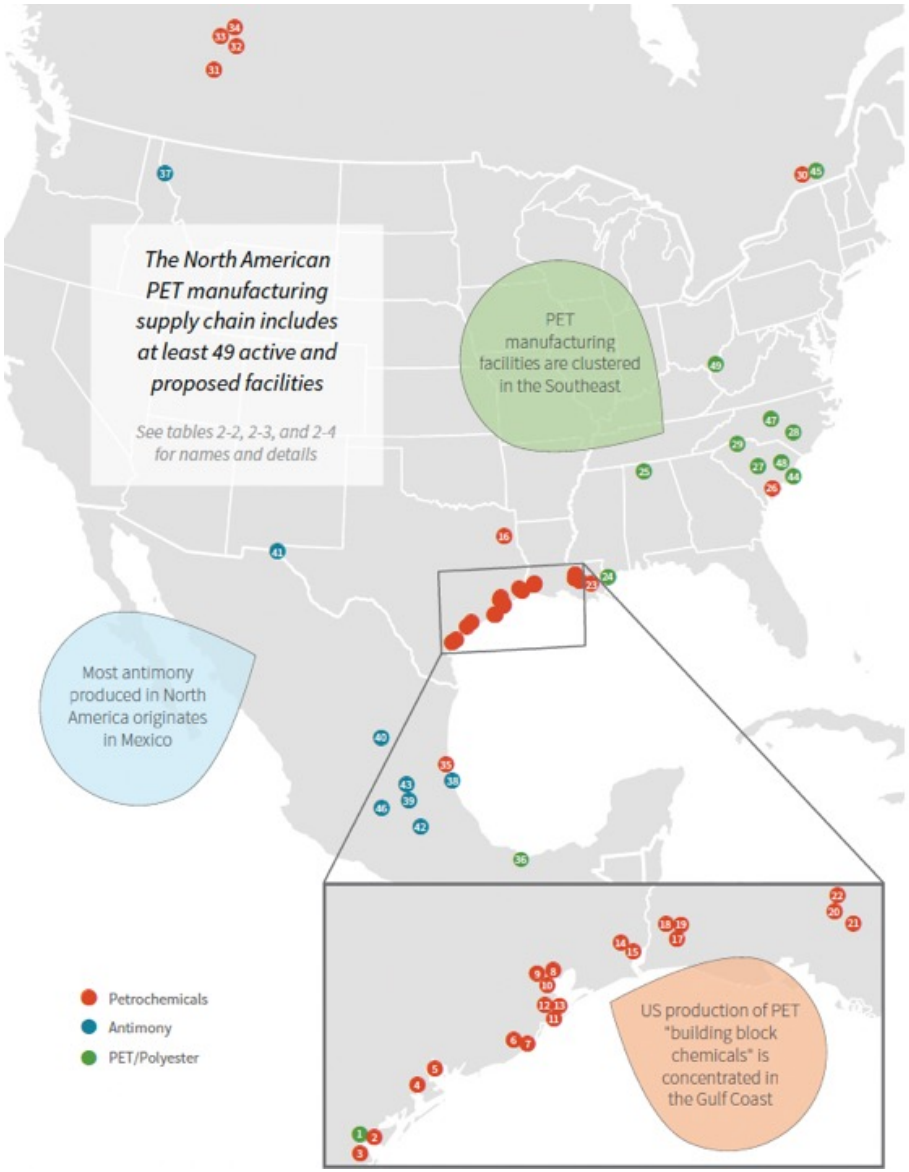

Map the Chemical Supply Chain –
PET Plastic in North America

(Left) Brenda Hampton at the Tennessee River. © Maya Rommwatt
(Right) Brenda Hampton and Marcus Echols at local food pantry in Moulton, AL
© Maya Rommwatt

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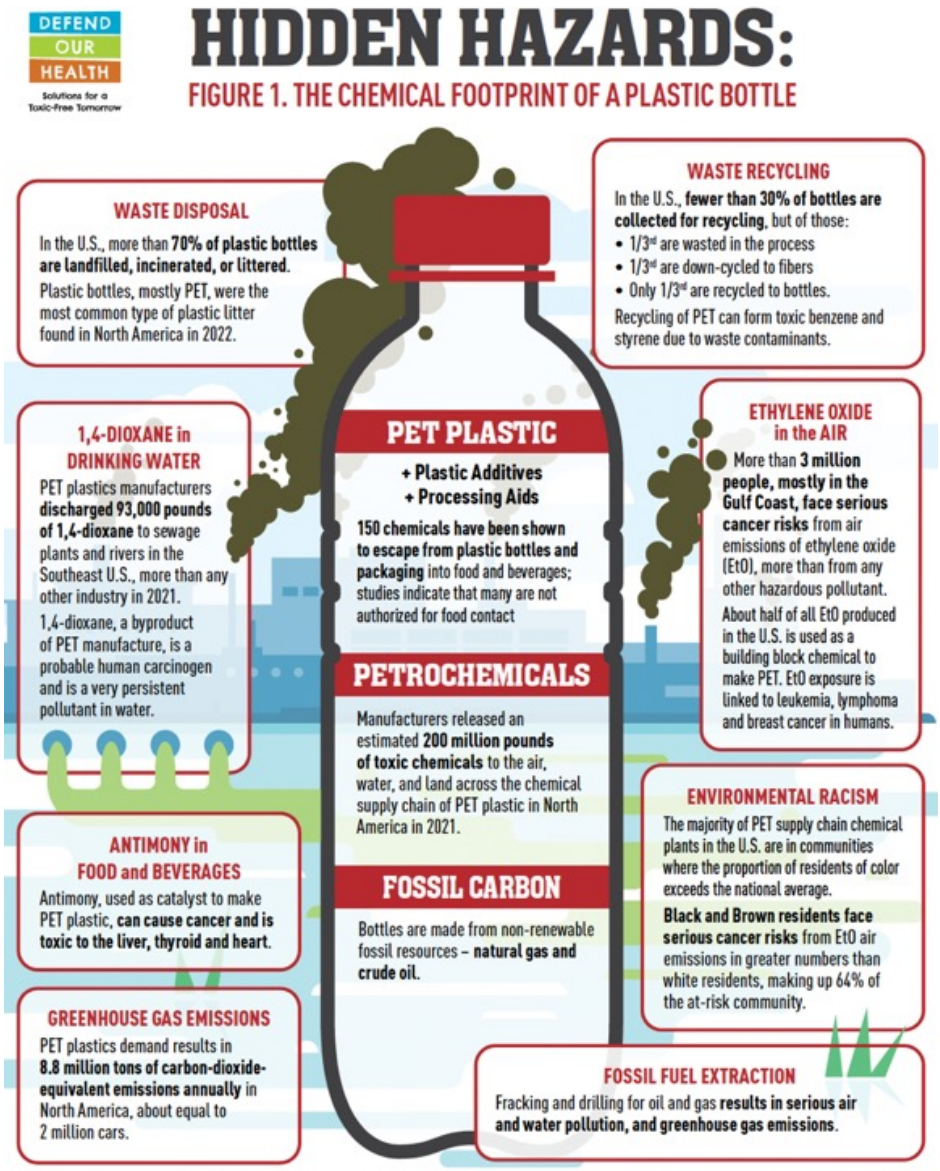

Every plastic product has a hidden footprint

UNSAFE:

Six known or probable human carcinogens are uniquely associated with the production, use, or disposal of polyethylene terephthalate (PET) plastic

UNJUST:

The PET-plastics related health burden falls heaviest on Brown, Black, and lower income people who live and work near chemical and plastics plants, with similar population-wide disparities from exposures to consumers of color and young children

UNSUSTAINABLE:

More than 99% of PET plastic is derived from **fossil carbon** from oil and gas; only 11% of PET and polyester in U.S. is ever collected for **recycling;** and **greenhouse gas emissions** from PET are projected to double in the next decade

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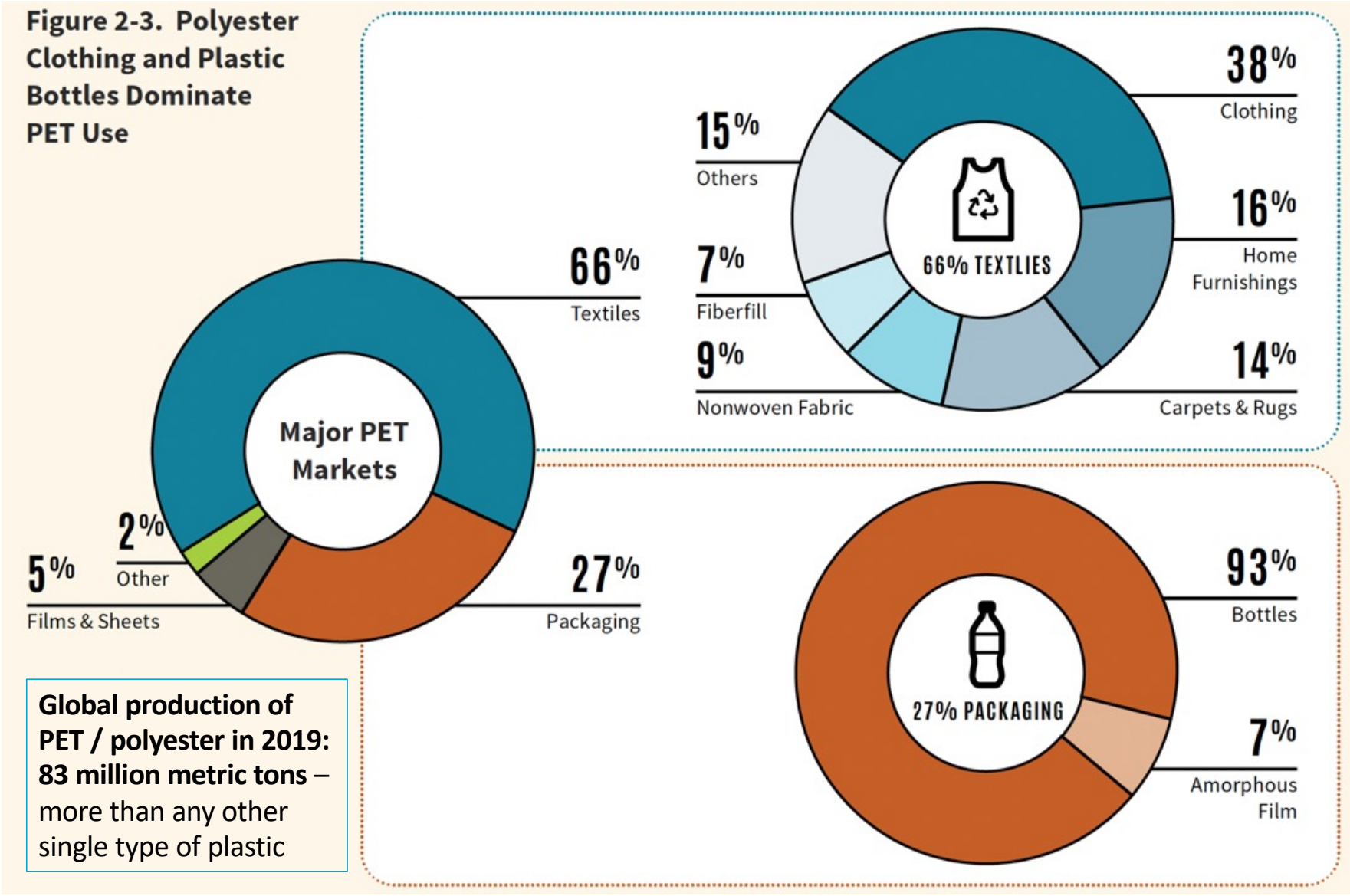

Global production of PET / polyester in 2019: 83 million metric tons – more than any other single type of plastic

21 million metric tons in 2019 – polyester makes up 54% of all fiber use globally

21 million metric tons in 2019 – including more than 500 billion beverage bottles!

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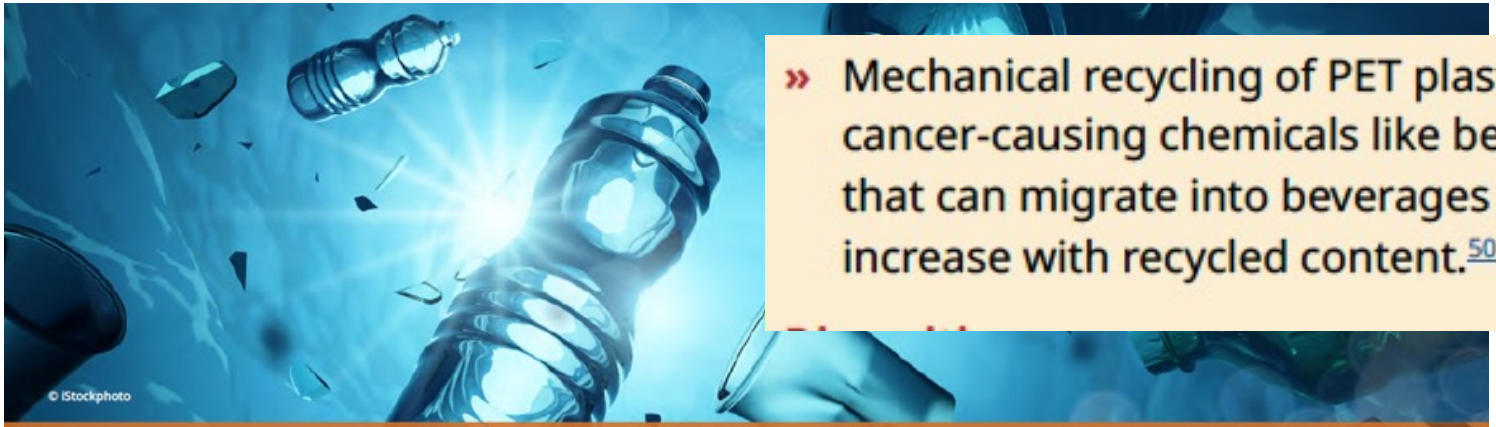
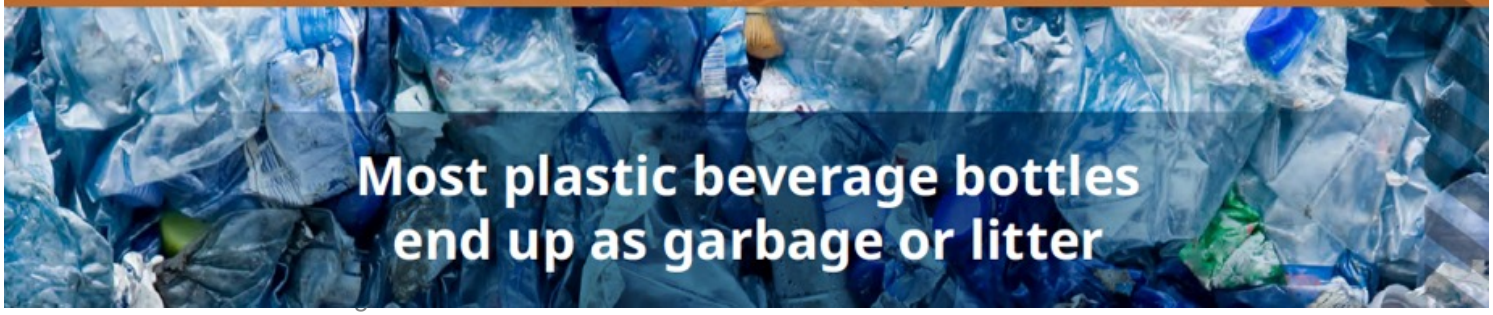


» Mechanical recycling of PET plastic bottles can form cancer-causing chemicals like benzene and styrene that can migrate into beverages in amounts that increase with recycled content.[50]

END OF LIFE:

PLASTIC BOTTLE WASTE



Most plastic beverage bottles end up as garbage or litter

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UNSUSTAINABLE

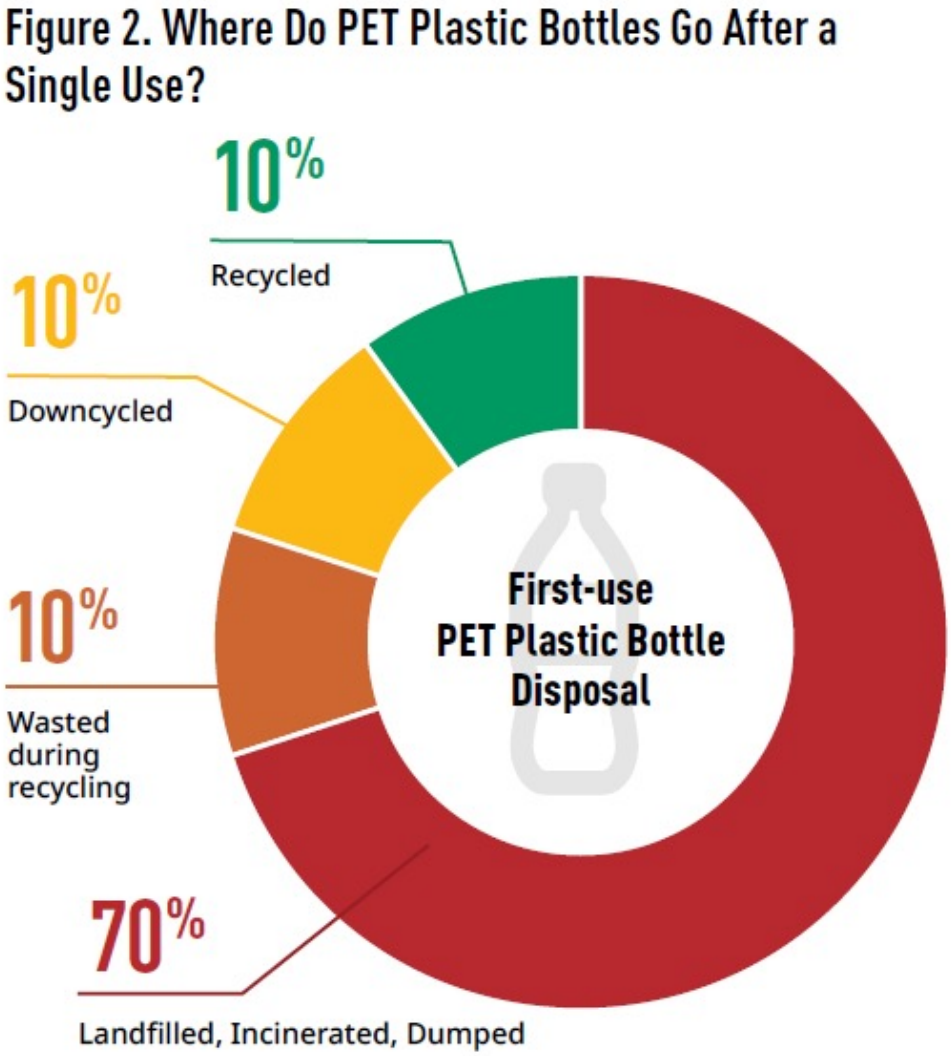
Among most recyclable plastics

70% wasted; 30% collected

Only 10% of PET
plastic bottles go back to bottles

NEW RESEARCH: Mechanical recycling of bottles produces **benzene** and **styrene** as byproducts. Non-detectable in virgin PET. Levels increase with recycled content. Migrates out from bottles. Probably due to PVC and PS contamination.

Source: Thoden van Velzen et al. (2020) *Packaging Technology and Science* https://doi.org/10.1002/pts.2528



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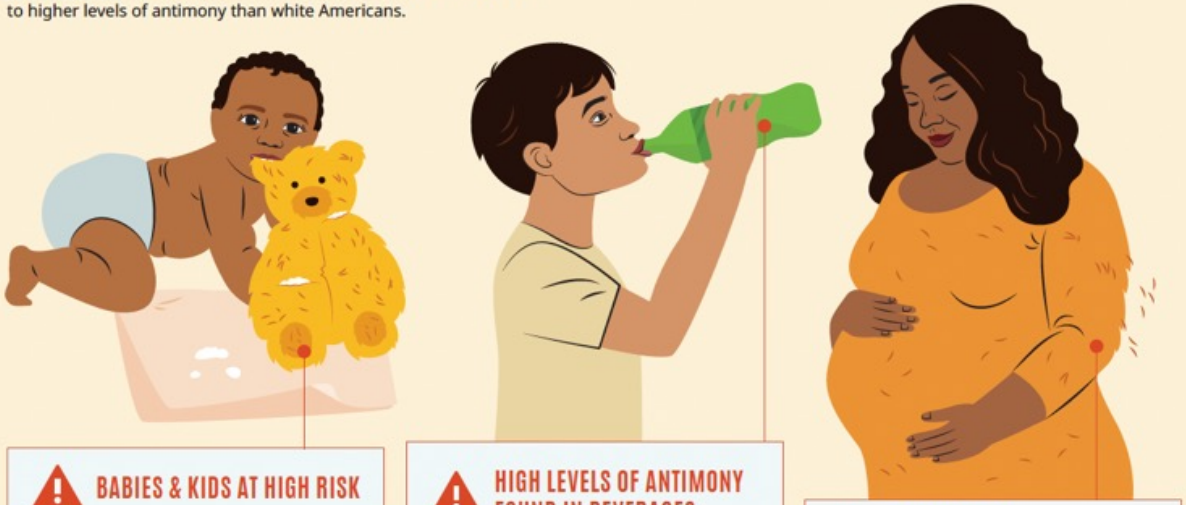
Your plastic bottle is more than just plastic.
It's a mix of all sorts of chemical additives and toxic byproducts, many of which can escape from the plastic. PET, also known as polyester, often contains **antimony, a toxic metal**. Health authorities try to limit our exposure to antimony, but too much is escaping from the plastics all around us.

PET plastic and polyester contribute to environmental racism and injustice. Nationwide, Latinx and Black consumers are exposed to higher levels of antimony than white Americans.

Why is PET harmful?
PET Plastic and Polyester are different forms of the same plastic *(polyethylene terephthalate)*. Antimony is one of many chemicals used to make PET; some of them are known to be toxic. These chemicals:

- ⚠ can increase risk of liver and heart disease
- ⚠ may cause lung and breathing problems
- ⚠ are linked with cancers
- ⚠ interfere with endocrine and hormone health



⚠ BABIES & KIDS AT HIGH RISK

Some **children are exposed daily to nearly double the safe limit for antimony** set by the US EPA, and six times the California standard.

How are kids exposed to so much antimony? One reason is likely the **antimony in many plastic products**, including **toys that babies suck on**. And due to their frequent hand-to-mouth activity, they may also ingest antimony shed from everyday plastics into household dust.

⚠ HIGH LEVELS OF ANTIMONY FOUND IN BEVERAGES

We tested drinks in plastic bottles from **Coca-Cola, Pepsi, Keurig Dr Pepper,** and other major brand owners.

40% **of the PET bottled beverage samples we tested had concentrations of antimony that exceeded the California Public Health Goal for drinking water.** Daily exposure above this amount may cause liver disease.

⚠ ANTIMONY IN POLYESTER CLOTHES

60% of all clothing currently produced has polyester.

Clothing and textiles can break down with use, which may **shed microplastics and antimony** in our homes, build up in dust, and may enter our bodies when we breathe, eat, and touch things around us.

PET Plastic Threatens Consumer Health

*A recent study investigated the migration of chemicals in PET beverage bottles, and found that **150 out of 193 tested chemicals have been known to migrate from the bottles into the beverages.** Of these, 18 exceeded EU limits, and 109 are not authorized substances in the EU. The authors note that many other chemicals that may be present in PET bottles have never been evaluated for migration. Recycling PET may further concentrate potentially hazardous chemicals.*

For more, see: Gerassimidou, S., Lanska, P., Hahladakis, J.N., Lovat, E., Vanzetto, S., Geueke, B. et al. (2022) Unpacking the complexity of the PET drink bottles value chain: A chemicals perspective. Journal of Hazardous Materials, 430. https://doi.org/10.1016/j.jhazmat.2022.128410

Consumer Health Hazard: Antimony

Antimony levels in 40% of the plastic-bottled beverages tested exceeded the California Public Health Goal for drinking water

BRAND OWNER BEVERAGE BRAND	DRINK TYPE	ANTIMONY IN BEVERAGE (PPB)
THE COCA-COLA COMPANY		
Coca Cola	Soda	**2.20**
Diet Coke	Soda	**1.22**
Honest Tea (w/ lemonade)	Tea	**1.07**
Simply Lemonade	Juice	**0.96**
Powerade Fruit Punch	Energy	**0.88**
Dasani	Water	0.17
PEPSICO, INC.		
Gatorade Blue Raspberry	Energy	**1.78**
Mountain Dew	Soda	**1.38**
Diet Pepsi	Soda	**1.10**
Pepsi	Soda	**0.98**
Tropicana Orange*	Juice	**0.56**
Aquafina	Water	0.19
KEURIG DR PEPPER INC.		
Motts Apple Juice	Juice	**0.98**
Dr Pepper		**0.85**
7up	Soda	**0.82**
Diet Dr Pepper	Soda	**0.79**
Snapple Peach tea	Tea	**0.50**
NESTLÉ S.A.		
Perrier	Water	**1.58**
OCEAN SPRAY CRANBERRIES, INC.		
Ocean Spray 100% Juice	Juice	**0.46**
CAMPBELL SOUP COMPANY		
V8	Juice	**3.45**

PLASTIC RESIN

POLYETHYLENE TEREPHTHALATE

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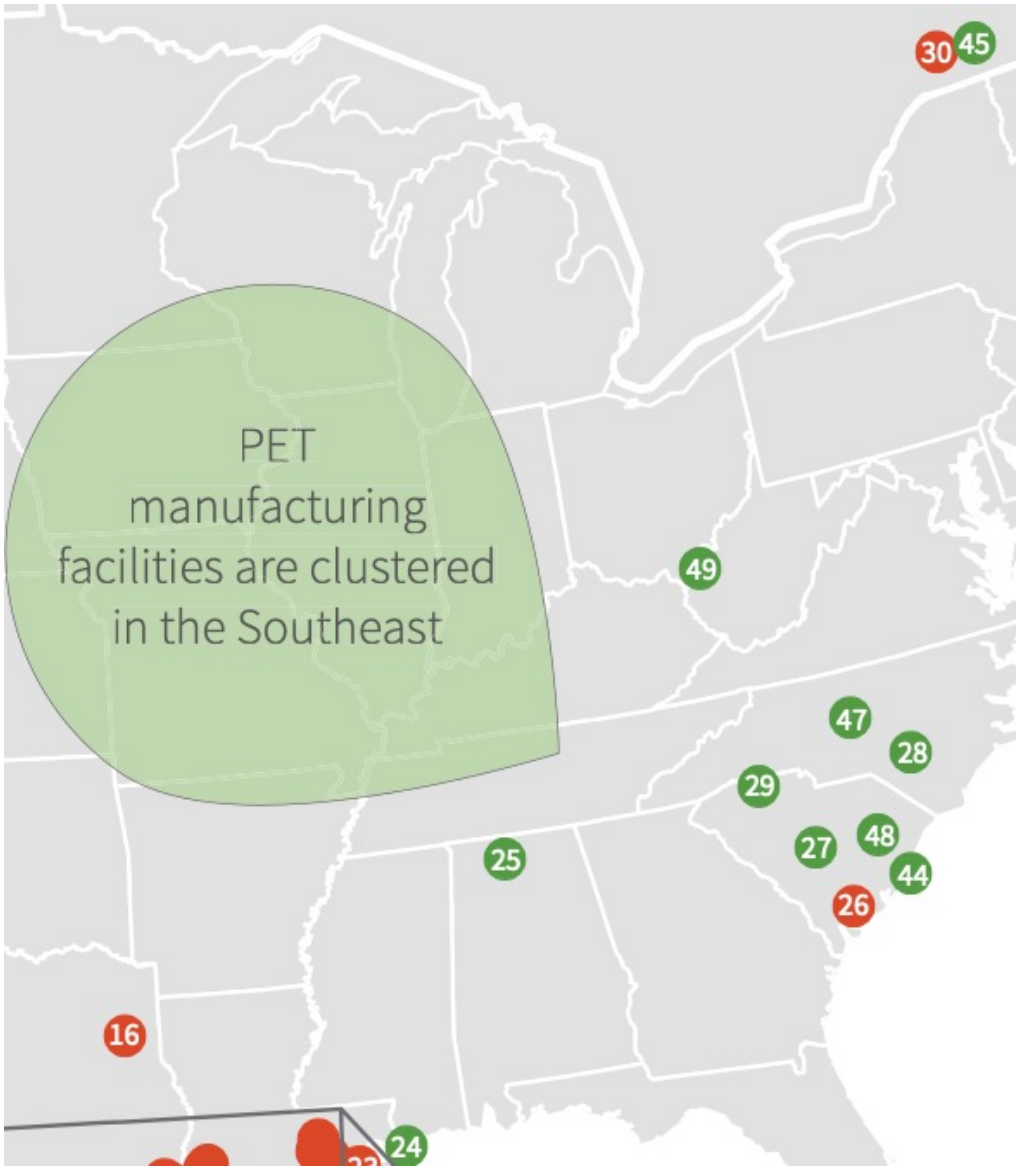
PET resin production is concentrated in the South-easten states



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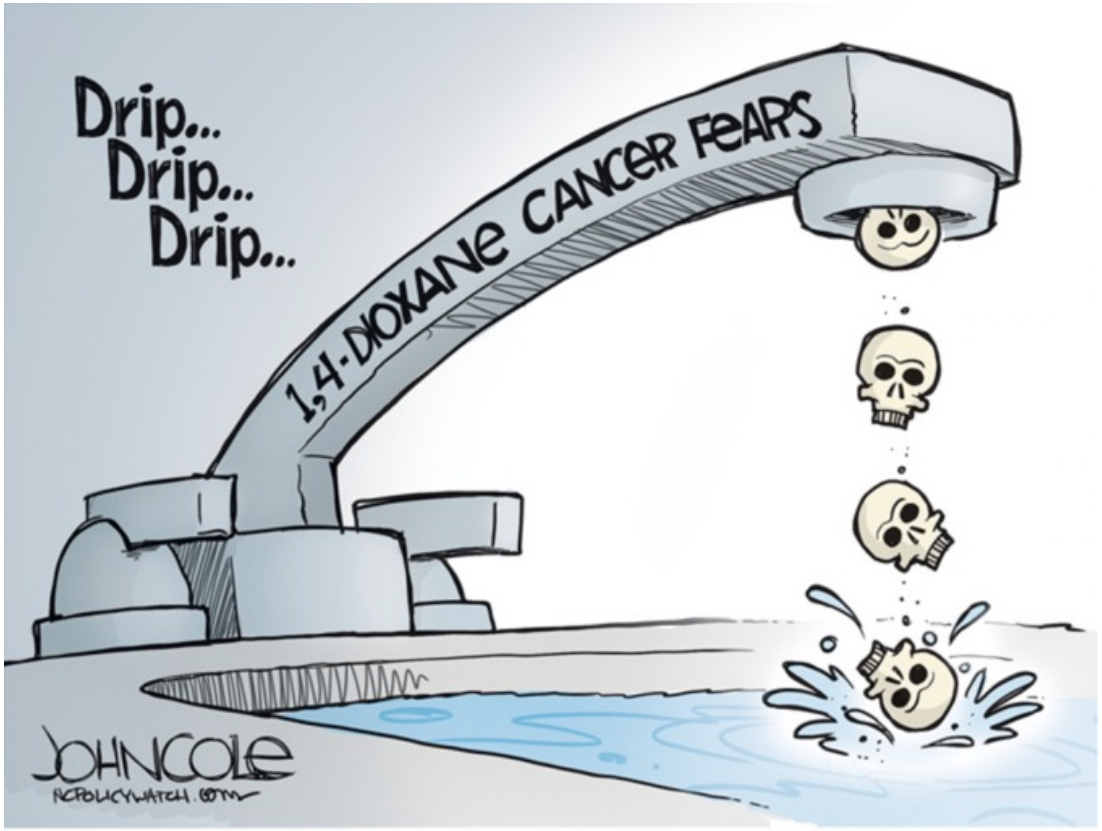
PET resin – Major Source of 1,4-Dioxane

- Probable human carcinogen
- Persistent in water

The PET plastics industry is the largest 1,4-dioxane polluter of any other industry in the United States.



https://pulse.ncpolicywatch.org/2022/04/08/chemical-facility-reports-its-the-source-of-latest-14-dioxane-spike-in-greensboro/#sthash.ww3GFenN.dpbs

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PET Plastic Industry is Top 1,4-Dioxane Polluter

Owner	PET Plant Name	Location	Wastewater Discharges	U.S. Rank	Air Emissions	U.S. Rank
Far Eastern	APG Polytech	Apple Grove, WV	36,667	1	716	14
Indorama	Indorama	Decatur, AL	28,233	2	8,329	2
Alpek	DAK Americas	Moncks Corner, SC	14,775	3	1,731	8
Indorama	StarPet	Asheboro, NC	9,406	4	154	23
Alpek	DAK Americas	Fayetteville, NC	2,611	7	885	11
Formosa	Nan Ya Plastics	Lake City, SC	764	10	1,712	9
Indorama	Auriga Polymers	Spartanburg, SC	230	11	809	13
Alpek	DAK Americas	Bay Saint Louis, MS	50	12	1,447	10
Alpek	DAK Americas	Gaston, SC	0	-	7,740	3

Releases in pounds in 2021 by PET plastic resin manufacturers. Wastewater includes discharge to water plus transfer to publicly-owned treatment works. Rank among more than 20,000 industrial facilities reporting to the U.S. EPA under the Toxics Release Inventory (TRI) Program.

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PET's Chemical Building Blocks

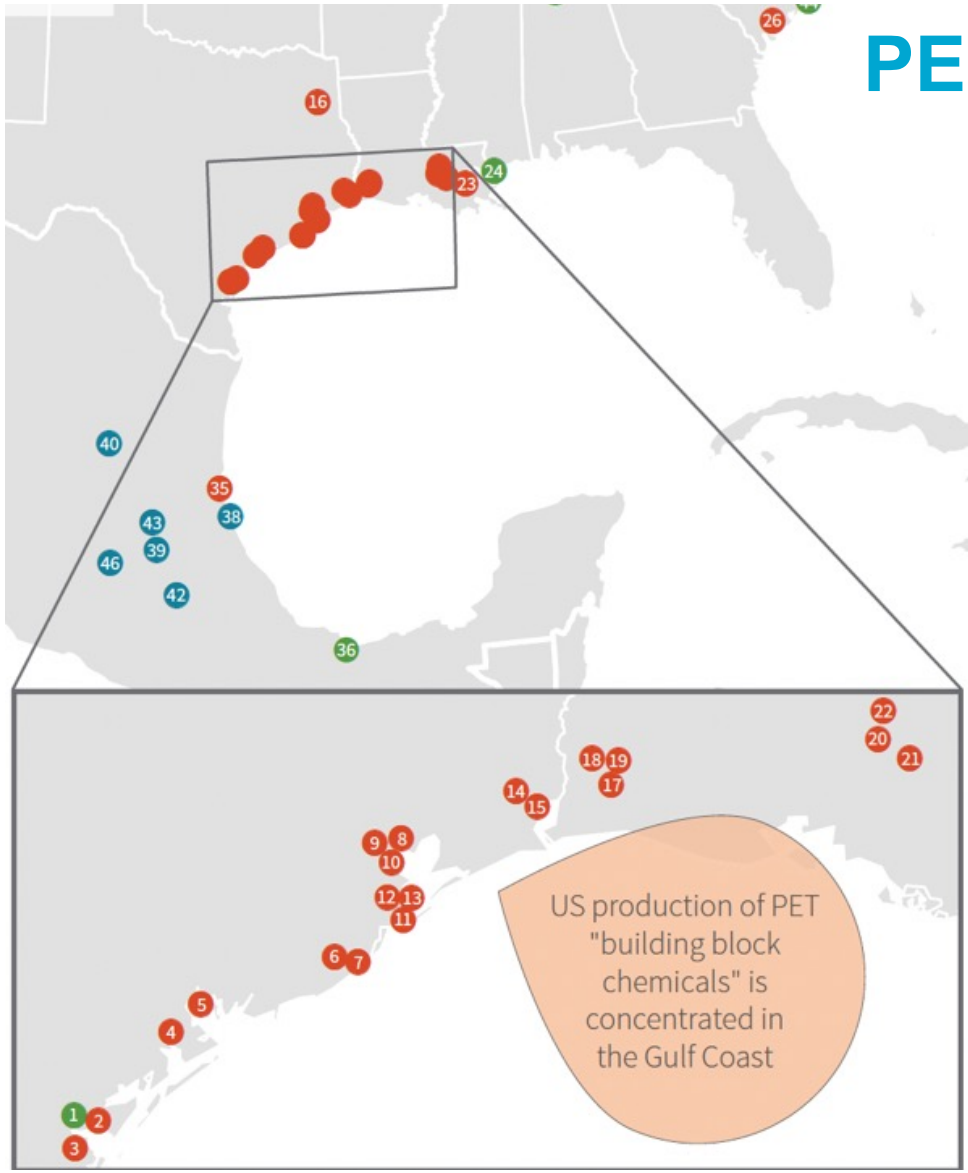

Table 2-2. Petrochemical Plants Known to Supply PET Plastic Production in North America

CHEMICAL COMPANY (Joint Venture Partners or Parent Company) *NOTE: Proposed chemical plants are highlighted in italics*	CHEMICAL PLANT LOCATION (City, State/Province, Country)			CHEMICAL PRODUCED					
				Eth	EtO	MEG	PX	AcOH	PTA
COASTAL BEND OF SOUTH TEXAS									
1. Corpus Christi Polymers (Alpek, Indorama, FarEast NC)	Corpus Christi	*TX*	*US*						*X*
2. Exxon Mobil / SABIC	Corpus Christi	TX	US	X	X	X			
3. Flint Hills Resources (Koch Industries)	Corpus Christi	TX	US				X		
4. Dow Chemical	Seadrift	TX	US		X	X			
5. Formosa Plastics	Point Comfort	TX	US		X	X			
GALVESTON BAY AREA / HOUSTON SHIP CHANNEL									
6. Dow Chemical	Freeport	TX	US	X					
7. MEGlobal (Dow Chemical / Petrochemical Industries)	Freeport	TX	US			X			
8. ExxonMobil Chemical	Baytown	TX	US				X		
9. Indorama Ventures	Clear Lake	TX	US		X	X		X	
10. Celanese	Pasadena	TX	US			X		X	
11. Ineos Aromatics	Texas City	TX	US				X		
12. Eastman Chemical	Texas City	TX	US					X	
13. Marathon Oil	Texas City	TX	US				X		
GOLDEN TRIANGLE (SOUTHEAST TEXAS) AND EAST TEXAS									
14. ExxonMobil Chemical	Beaumont	TX	US				X		
15. Indorama Ventures	Port Neches	TX	US		X	X		X	X
16. Eastman Chemical	Longview	TX	US		X	X			
LAKE CHARLES AREA OF SOUTHWEST LOUISIANA									
17. Indorama Ventures	Westlake	LA	US	X					
18. LACC (Lotte Chemical / Westlake Chemical)	Westlake	LA	US	X	X	X			
19. Sasol	Westlake	LA	US		X	X			
CANCER ALLEY, LOUISIANA AND GULF COAST MISSISSIPPI									
20. Dow Chemical	Plaquemine	LA	US		X	X			
21. Shell Chemical	Geismar	LA	US		X	X			
22. Formosa Plastics	Welcome	*LA*	*US*		*X*	*X*			
23. Dow Chemical	Taft	LA	US		X	X			
24. DAK Americas (Alpek)	Bay St. Louis	MS	US						X
NORTHERN ALABAMA AND THE CAROLINAS									
25. Indorama Ventures	Decatur	AL	US				X		X

Ethylene Oxide (EtO) – Major Cancer Risk

- **Known human carcinogen – leukemia, lymphoma, breast cancer**
- Responsible for 79% of U.S. cancer risk from hazardous air pollutants
- US EPA upheld its finding that EtO is sixty times more potent as a cancer-causing substance than previously thought, in Dec. 2022
- *EtO air emissions will be reduced by less than 70%* if recently adopted rules (NESHAP) under the Clean Air Act are fully enforced
- **EPA failed to require leakless valves** at chemical manufacturing plants to eliminate so-called fugitive emissions from leaking equipment
- **More than 3 million people will still face serious cancer risk** from EtO exposure after rule adoption (at the one-in-one-million risk level)

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Table 1. EPA's proposed rule would still leave millions of people at serious risk of cancer

Hazardous Air Pollutant Emissions from Synthetic Organic Chemical Manufacturing Industry	Lifetime Cancer Risk for People who Live within 50 km (31 miles) of the Chemical Manufacturing Plants (cancer risk expressed as number in one million)					Cancer Incidence (in cases per year)
	≥ 1	≥ 10	≥ 100	> 100	≥ 1,000	
Cancer Risk Level:	**Serious [15]**	**Significant [16]**	**Unacceptable [17]**			
BASELINE - Number of People at Risk (before HON rule)	7.2 million	2.3 million	150,000	87,000	2,900	2
POST-CONTROL Number of People at Risk (after rule)	5.7 million	570,000	4,700	0	0	0.4
REDUCTION in the At-Risk Population (by proposed rule)	21 %	75 %	96 %	100 %	100 %	80 %

PET Plastic Drives Ethylene Oxide Cancer Risk

Owner	Chemical Plant Name	Location	Air Emissions	U.S. Rank
Indorama Ventures	(Huntsman Petrochemical)	Port Neches, TX	18,980	1
Lotte / Westlake	LACC / Lotte Chemical	Westlake, LA	10,525	4
Formosa Plastics	Formosa Plastics	Point Comfort, TX	7,717	5
Dow Chemical	Union Carbide	Hahnville (Taft), LA	7,449	6
Eastman Chemical	Eastman Chemical	Longview, TX	6,219	7
Shell Oil	Shell Chemical	Geismar, LA	4,981	10
Dow Chemical	Union Carbide	Seadrift, TX	4,612	11
Sasol	Sasol Chemicals	Westlake, LA	3,500	12
Dow Chemical	Dow Chemical	Plaquemine, LA	2,849	15
Indorama	Celanese – Clear Lake	Pasadena, TX	1,569	25
TOTAL:	**10 chemical plants out of top 25 EtO polluters**		68,401	

Total pounds released to air in 2021 by manufacturers of ethylene oxide (EtO) used to make monoethylene glycol for production of PET plastic including polyester. Rank among more than 20,000 industrial facilities reporting to the U.S. EPA under Toxics Release Inventory program.

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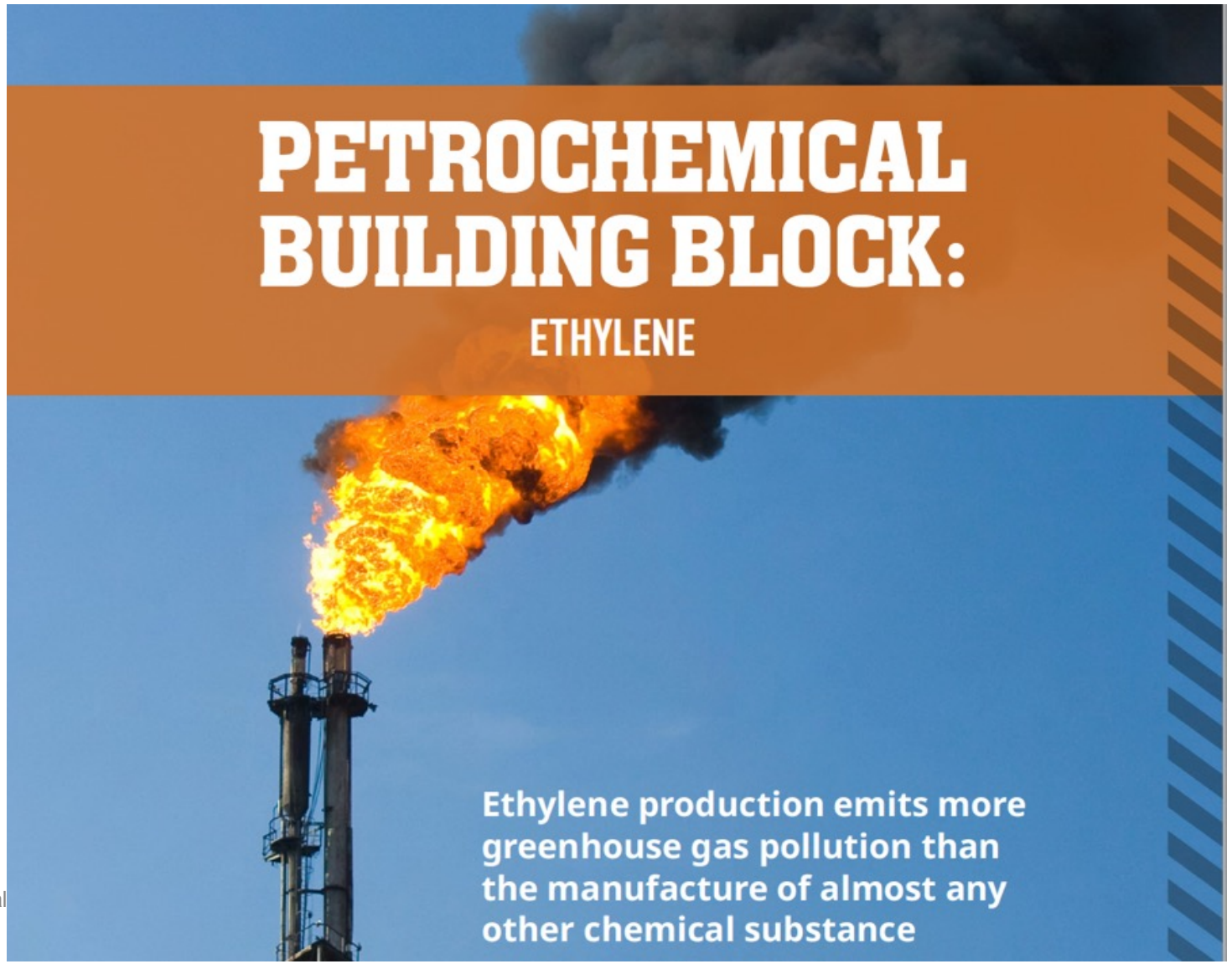

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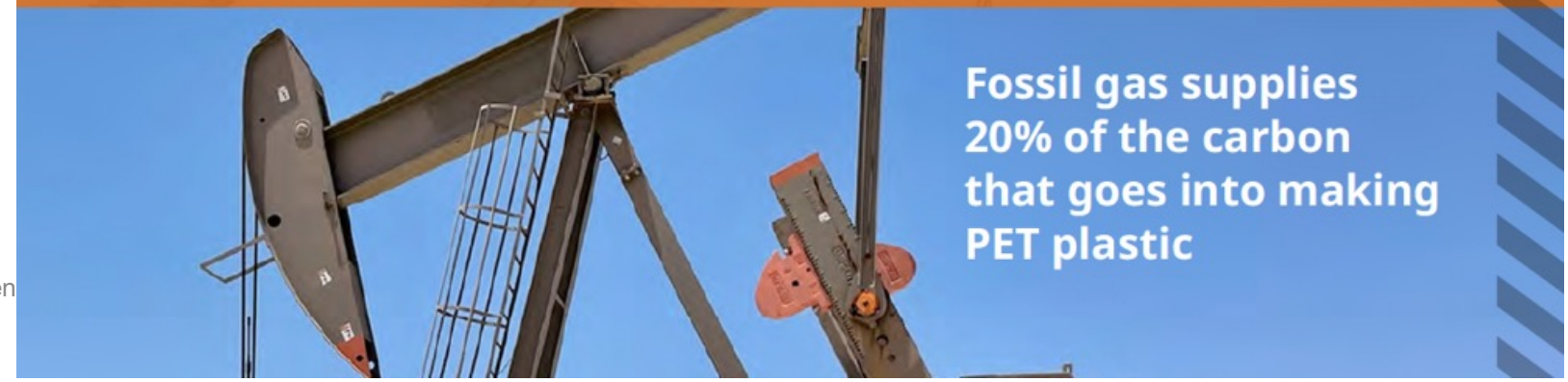
NONRENEWABLE RESOURCE:

NATURAL GAS



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PETROCHEMICAL BUILDING BLOCK:

TEREPHTHALIC ACID

Demand for PET plastic and polyester results in air emissions of carcinogenic cobalt

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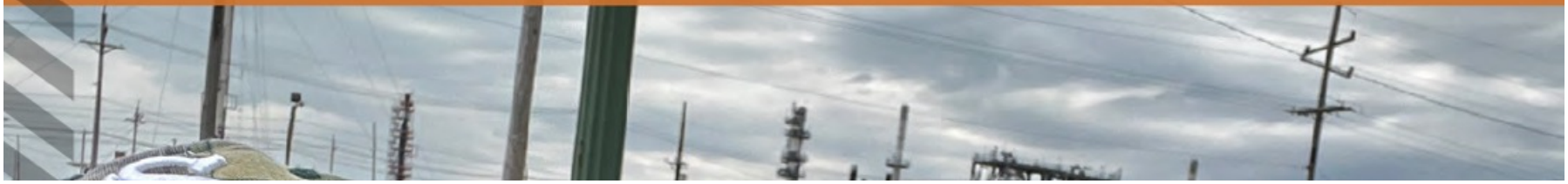
PRIMARY PETROCHEMICAL:

PARA-XYLENE



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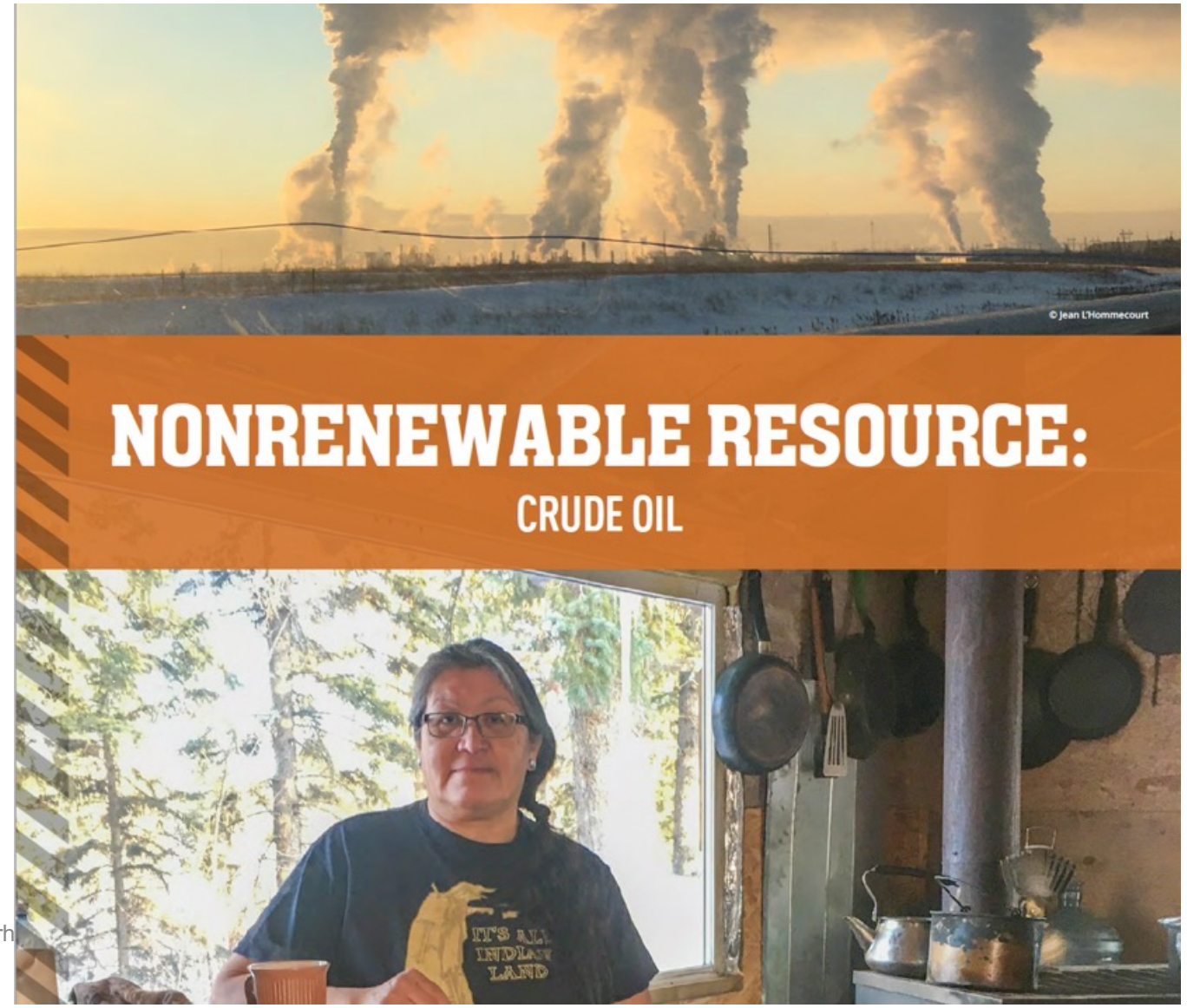

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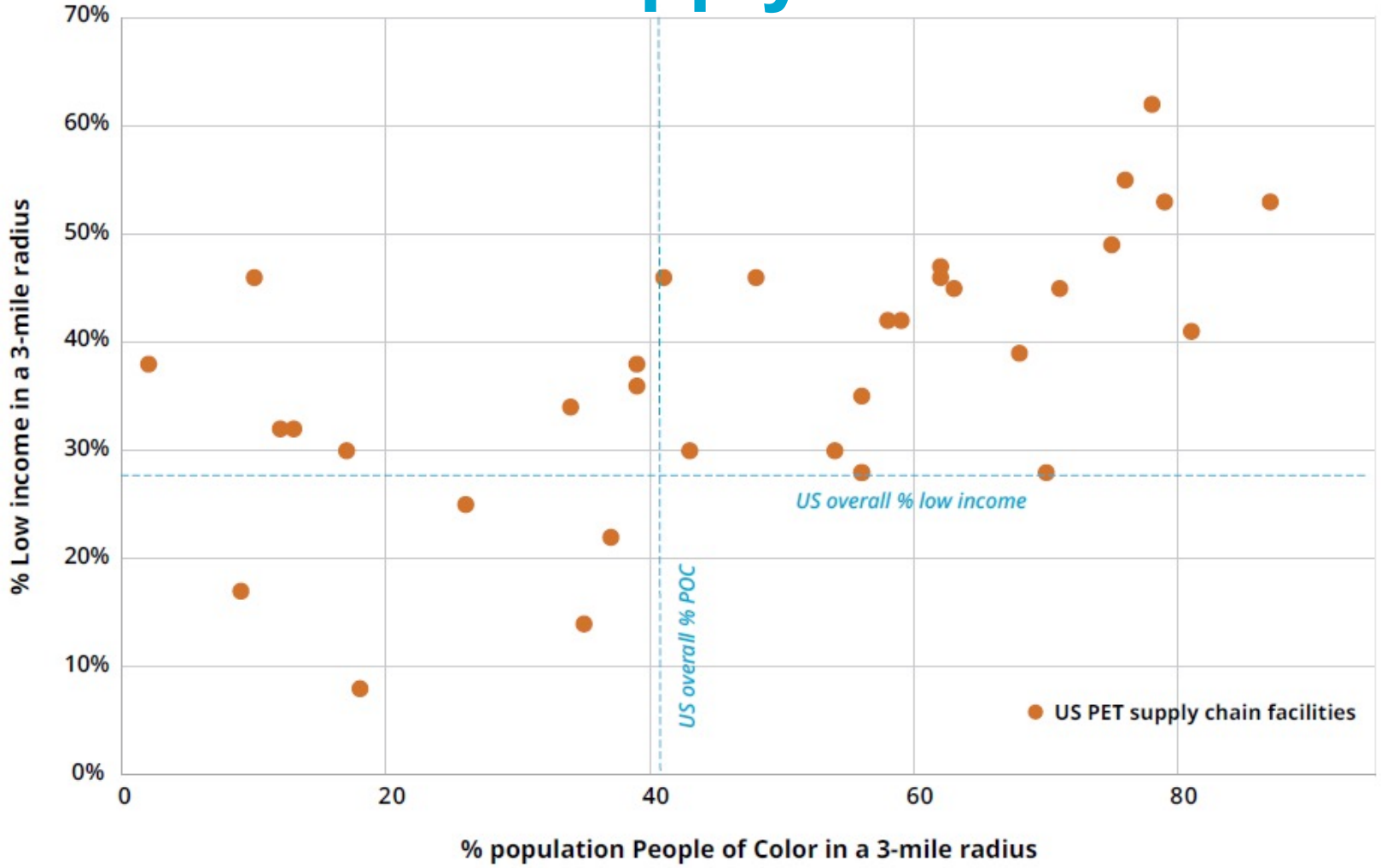
UNJUST: US supply chain locations



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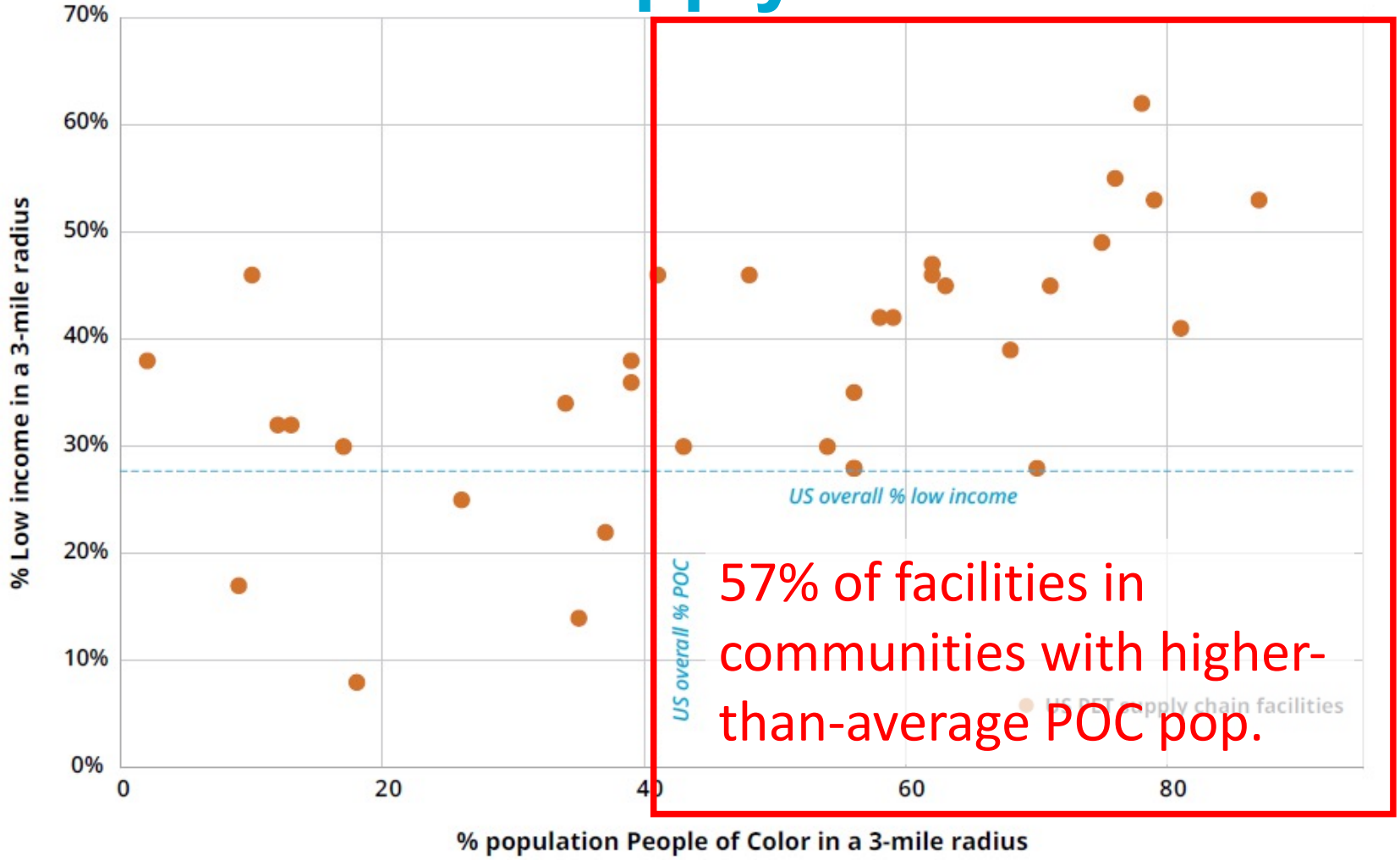

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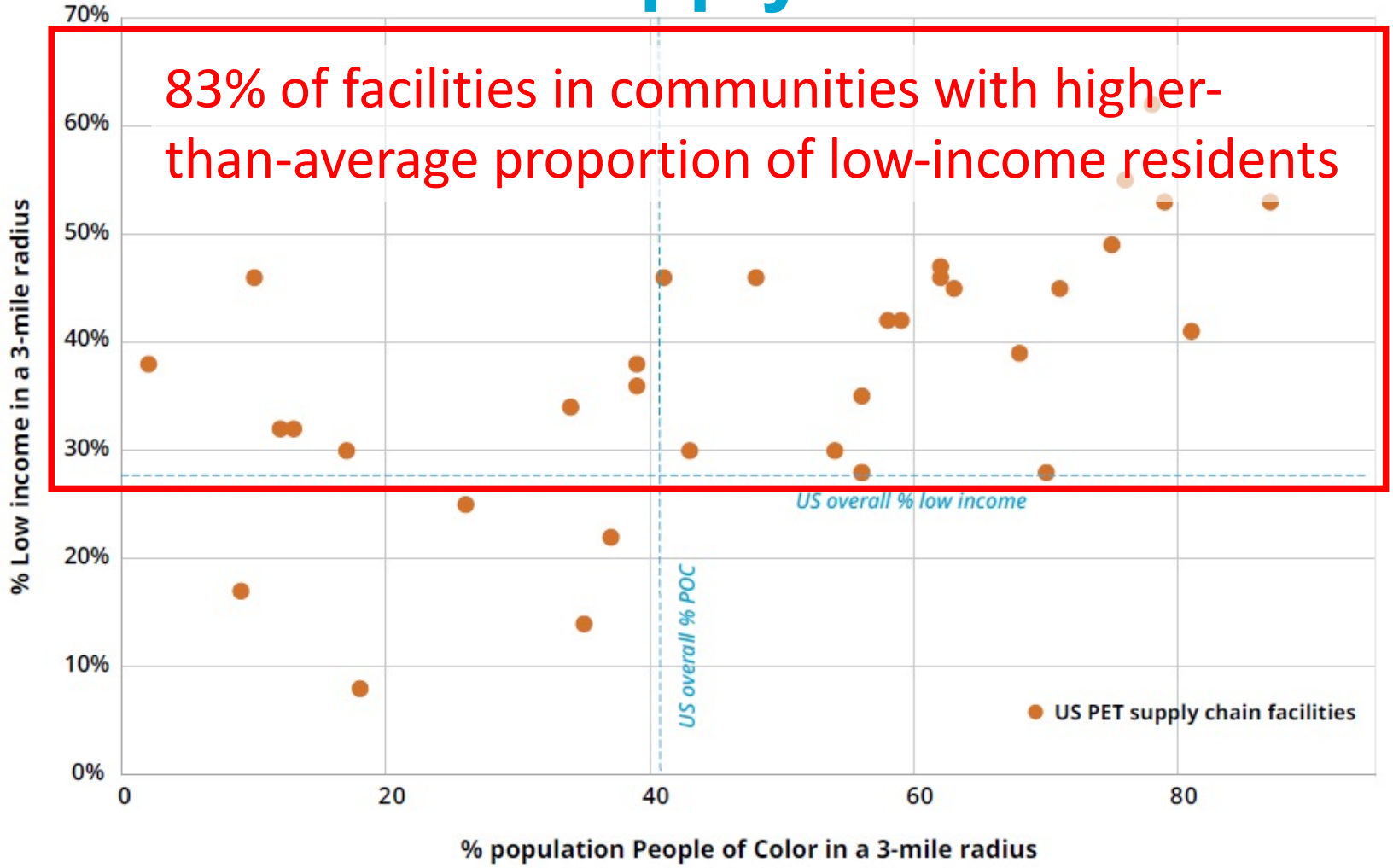

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Accounting for the Chemical Footprint of a Plastic Bottle

The **chemical footprint** of a plastic beverage bottle starts with fossil carbon extraction, grows through the several stages of petrochemical refining and manufacturing that go into producing PET plastic resin, and continues after the bottle's use and disposal. The **chemical supply chain** portion of this footprint begins with resource extraction and culminates with a beverage bottle ready for filling. The pollution, environmental justice, and climate change impacts of the PET plastic bottle chemical supply chain in North America are summarized below.

Plastic bottles drive about 25% of global demand for PET plastic.[250] The **Coca-Cola Company, one of the world's largest consumers of PET plastic bottles, buys more than 125 billion PET bottles per year globally.**[251] That's more than 20% of the worldwide demand for PET plastic beverage bottles.[252]

Through its reliance on plastic bottles, Coca-Cola alone consumes almost 6% of all PET plastic produced in the world (see Appendix H for calculations). This market share means that Coca-Cola should bear responsibility for about 6% of the known hazards of PET plastic across its chemical supply chain. Some of the hazards of the PET supply chain in the US are summarized in Table 4.

These hazards and Coke's market share are the reason that The Coca-Cola Company should lead the market in reducing the chemical footprint of its PET plastic bottles.

Table 4. Impacts of PET Plastic Across the US Chemical Supply Chain[253]

HEALTH	
Toxic Releases	211.5 million total pounds of toxic chemicals are released to air, water and land across the PET plastics supply chain in North America.[254]
Ethylene oxide	More than 50% of production of EtO is driven by PET plastic demand.[255] 6 of the top 10 industrial air emitters of EtO in the US are PET supply chain facilities.
1,4-Dioxane	4 of the top 5 industrial dischargers of 1,4-dioxane to water and sewage plants in the US are PET resin plants (and 8 of the top 12).[256] 4 of the top 10 industrial air emitters of 1,4-dioxane in the US are PET resin plants (and 8 of the top 14).[257]
Cobalt	Major source of cancer risk from chemical plants that produce PTA for PET. [258]
Antimony	Independent testing found 40% of PET-plastic-bottled beverage samples tested in the US exceeded the California Public Health Goal for antimony in drinking water. [259]
Benzene	Co-produced and released during production of mixed xylenes including PX for PET.
JUSTICE	
Environmental Racism	57% of PET supply-chain chemical plants in the US are in communities where the proportion of residents of color exceeds the national average.
Income inequality	83% of PET supply-chain chemical plants in the US are located in communities where the proportion of residents who are low income exceeds the national average.
Population Wide	79% of municipal waste incinerators in the US are located in communities where at least 25% of the population are people of color or at least 25% of people live below the federal poverty rate.[260] One study found 50% higher exposure to antimony experienced by Latinx and Black consumers compared to white consumers in the US.[261]
CLIMATE	
Fossil Resource Use	More than 99% of PET plastic is made from fossil carbon from oil and gas, both nonrenewable
Greenhouse Gas Emissions	8.8 million metric tons annual emissions from the North American PET supply chain, in tons of CO^2 equivalents.[263]

RECOMMENDATIONS

Market leaders and the federal government are in the best position to reduce the chemical footprint of a plastic bottle.

The Coca-Cola Company and other beverage brand owners should reduce the chemical footprint of their plastic bottles by taking these actions:

1. Immediately require PET resin suppliers to end all use of cancer-causing **antimony** and **cobalt** compounds as processing aids or additives in the production of PET plastic resin used for bottles;
2. Require PET resin suppliers to achieve zero discharge of cancer-causing **1,4-dioxane** to all drinking water sources as soon as practicable;
3. Require upstream chemical suppliers for PET plastic to virtually eliminate all air emissions of cancer-causing **ethylene oxide** as soon as practicable;
4. Offset **environmental injustice** by investing in community-based programs that benefit residents who live near plants along PET chemical supply chain;
5. By 2025, assess the hazards of **all chemical substances** used or produced to make PET plastic using the GreenScreen® for Safer Chemicals and disclose the results publicly;
6. By 2030, replace at least 50% of plastic bottles with reusable and refillable containers that are GreenScreen Certified™ for reusable food service; and
7. By 2040, phase out all use of virgin fossil PET plastic in favor of safer solutions, including more just and sustainable materials.

The **US EPA** should continue to lead by acting to:

- Strengthen its proposed Hazardous Organic NESHAP rule to further reduce **air emissions of ethylene oxide** to achieve a greater than 90% reduction in population cancer risk for the more than 3 million predominantly Black and Brown residents that will still face serious excess cancer risk greater than one in one million if the rule is adopted as proposed;
- Determine that **1,4-dioxane in drinking water** poses an unreasonable risk to human health in the risk evaluation soon to be issued under the Toxic Substances Control Act. This action should trigger risk management proposals to achieve zero discharge of 1,4-dioxane from PET plastics production plants.

The **US Food and Drug Administration** should use its food safety authority to:

- Declare that **antimony in food and beverages** is an unauthorized adulterant that requires immediate action by the PET plastics, beverage, and packaging industries to replace its use with safer alternatives by a date certain.

Thank You

DISCUSSION

Mike Belliveau

mbelliveau@defendourhealth.org Twitter: @preventharm

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EXTRAs

Migration of chemicals from PET & polyester increases with …

Figure 3-1. Antimony Migration Increases with Temperature in Bottled Beverages

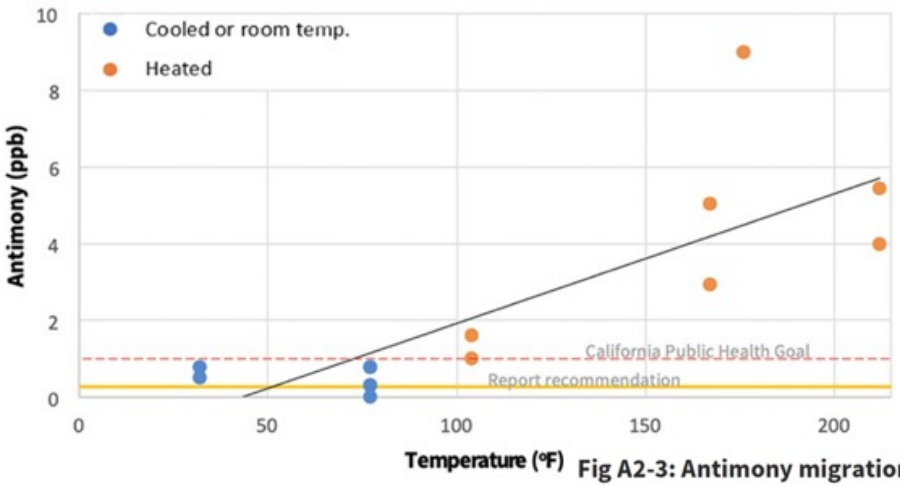


Fig A2-2. Antimony migration increases in more acidic beverages

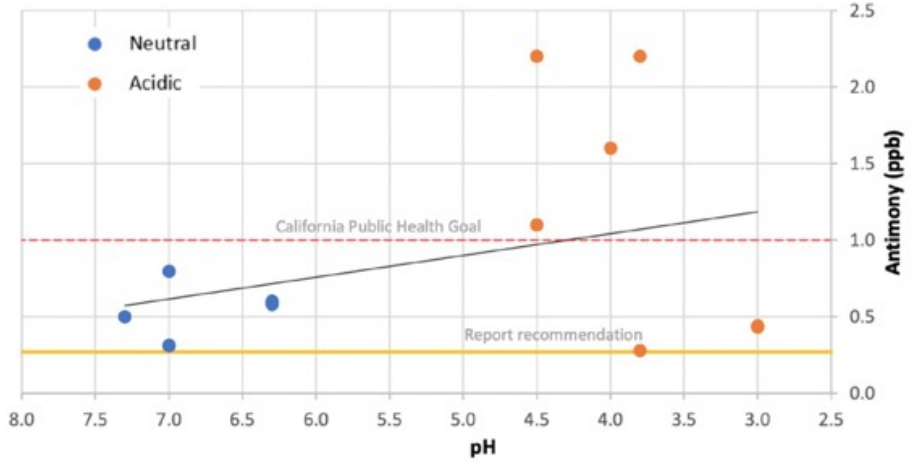
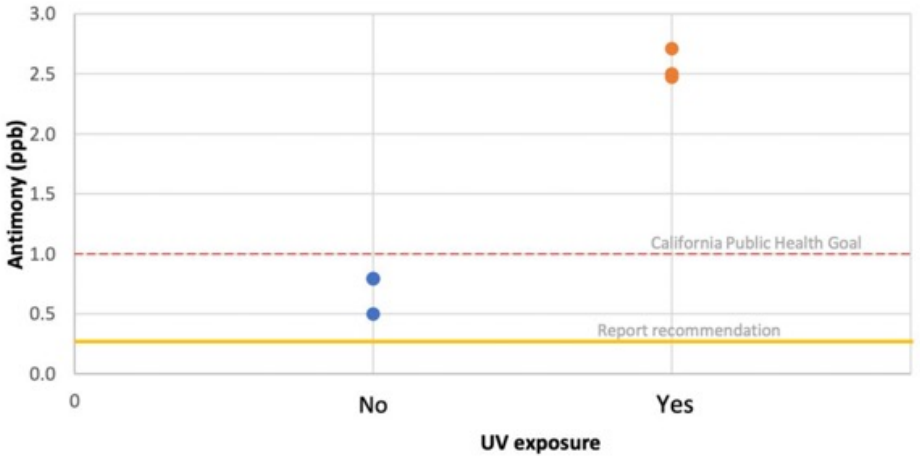


Fig A2-3: Antimony migration increases with exposure to UV radiation in bottled beverages

Data sources: Westerhoff et al. 2008 [19]; Cheng et al. 2010 [20] Chapa-Martinez et a

2016 [8]. Each point represents one PET bottled



- Temperature
- Acidic Contents
- Exposure to Sunlight
- Storage Time

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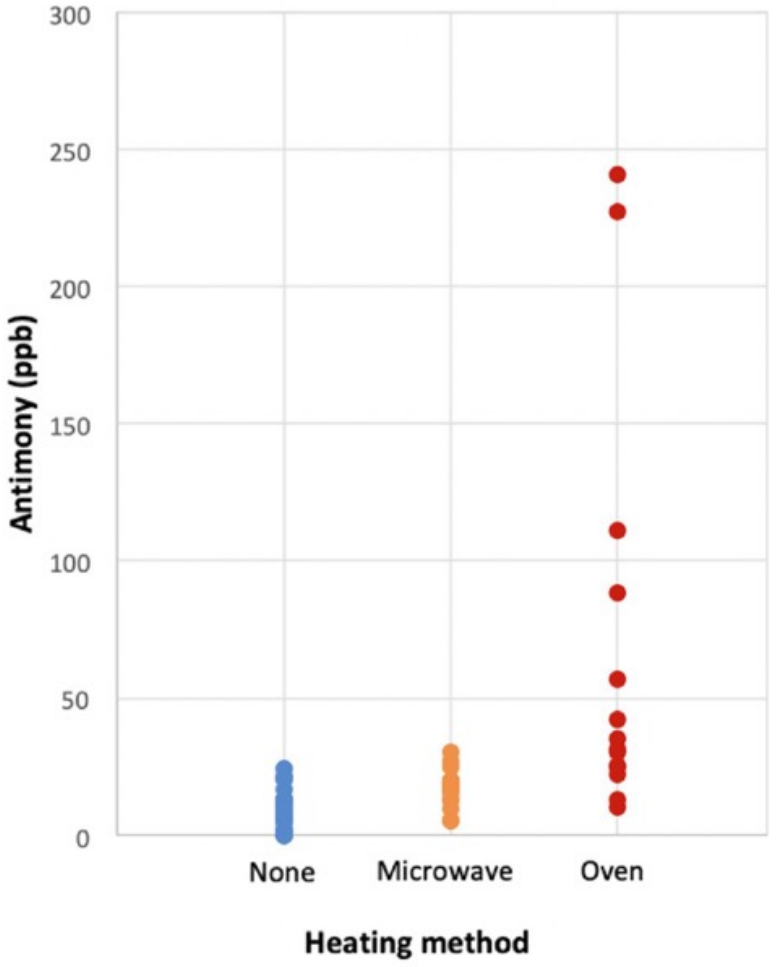
PET plastic and food – a toxic recipe

Heating food in "microwave/oven safe" PET containers may expose consumers to elevated concentrations of antimony



Sources: Haldiman et al. 2007 [6]; Cheng et al. 2010 [3]. Each point represents one PET packaging sample. See sources for testing methods used in each study.

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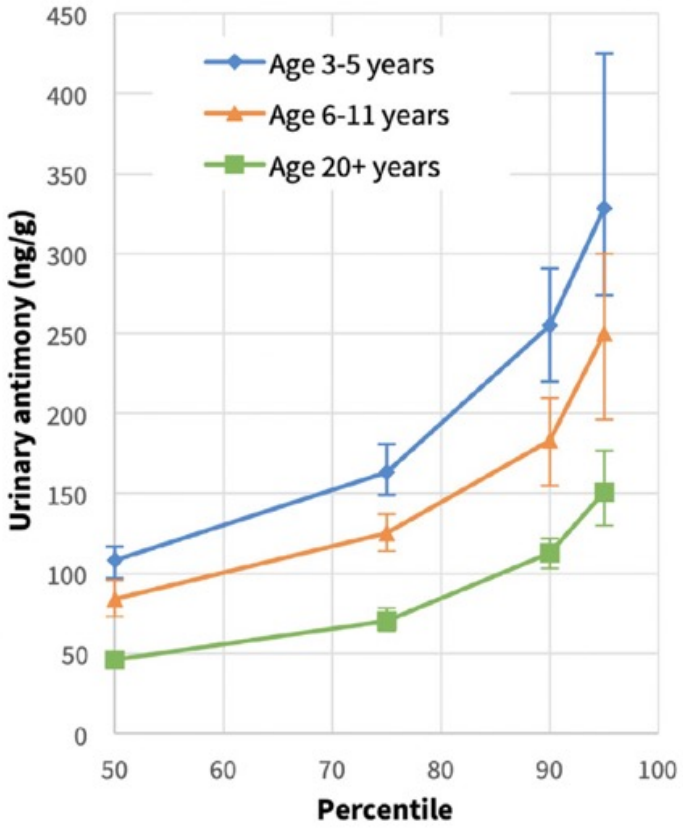
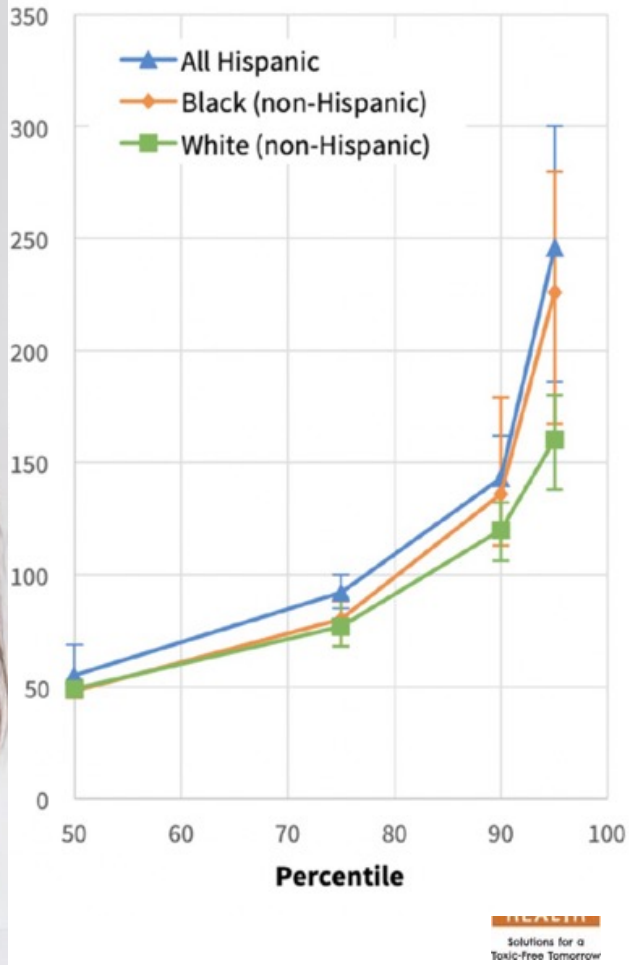
Unjust Across the USA

Figure 3-3. Children are More Exposed to Antimony than Adults



Creatinine-corrected urinary antimony concentration, from the National Report on Human Exposure to Environmental Chemicals (2022) [30]



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EXPOSURE PATHWAY	EXPOSURE SOURCE	DAILY EXPOSURE (IN NG/KG/D) TYPICAL	HIGH	NOTES
INGESTION	PET Plastic Bottles	12	29	Based on migration into bottled water before and after six months of storage [16]. Greater migration likely from plastic-bottled soda and juices due to lower pH (higher acidity).
	Drinking Water	?	24	May be higher from antimony leaching from plumbing materials and fittings, including tin solder [18].
	Food	62	80	Based on a well-balanced diet. May be higher from migration from heated PET plastic food trays [23].
	Polyester Cuddly Toys	?	208	Children who suck or chew on cuddly toys, blankets, and other polyester or PET plastic items, extract antimony in their saliva, and/or ingest polyester particles or fibers.
	House Dust	133	500	About 100 milligrams per day of dust are ingested by children's frequent hand-to-mouth activity [33]. Sources include antimony used with flame retardants in plastics.
Estimated child exposure from ingestion only		**> 207**	**841**	
DERMAL	Polyester Fabric	?	?	Antimony can escape from polyester clothing during skin contact with perspiration [34]. Sleeping with cuddly toys may also cause antimony exposure from skin contact.
	Upholstered Furniture	?	1,500	Skin contact with textiles with antimony trioxide added to enhance effect of flame retardant chemicals.
INHALATION	House Dust	5	21	Assumes that a child aged 1 to <2 years old inhales eight meters cubed of air per day of air [33].
	Outdoor Air	?	21	
Estimated child exposure from all sources		**> 212**	**2,383**	
Daily Exposure Limit	California EPA, OEHHA:	140		Acceptable Daily Dose (ADD) of antimony for its Public Health Goal for Antimony in Drinking Water (2016) [35]
	Unites States EPA, IRIS:	430		Reference dose (RfD) for antimony adopted by U.S. Environmental Protection Agency, IRIS (1987) [36]

Source: Unless otherwise noted, all values are based on the European Union Risk Assessment Report: Diantimony Trioxide (2008) [24], an aggregate

Children are Exposed Daily to Unsafe Levels of Antimony

Exposures reported below for plastic bottles, drinking water, food, and upholstered furniture are estimates for adult exposures from authoritative sources. Note that on a per unit body weight basis, children drink more fluids, eat more food, breathe more air, and have a greater skin surface area than adults [31]. Therefore, the values reported below are likely to be underestimates for children's exposure.

Table 3-B1. 60% of Antimony is Used as a Plastic Additive

USE CATEGORY	MAJOR PRODUCTS	SHARE (2010)	MAJOR MARKETS	MARKET SHARE
Plastic Additive	**Flame Retardants**	52%	PVC (vinyl) plastic Other plastics * Rubber Textile back-coating	42% 40% 10% 8%
	PET Catalyst	6%	Polyester clothes, textiles PET plastic bottles Other PET packaging Other PET use	66% 24% 5% 5%
	Heat Stabilizer	1%	PVC (vinyl) plastic	
	Colorant	1%	Yellow-orange pigments	
Other Additive	**Glass**	1%	Solar cell glass Cathode ray tubes	
	Ceramics	1%	Construction	
Metallurgical	**Batteries**	27%	Lead-acid batteries	
	Lead Alloys	11%	Construction Ammunition	

Source: Unless otherwise noted, all values are based on the European Union Risk Assessment Report: Diantimony Trioxide (2008) [24], an aggregate risk assessment developed for Europe by the Swedish Chemical Inspectorate. See pp. 362-384. Daily exposure values are expressed as nanograms o antimony per kilogram of bodyweight per day. About half the population is exposed at the "Typical" exposure level. "High" exposure represents a reasonable worst-case scenario for each source. Additional exposure not included above occurs during breastfeeding.

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